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. THE PHILIPPINE

JOURNAL OF SCIENCE

C. BOTANY

VOL. VI MARCH, 1911 No. 1

PHILIPPINE URTICACEAE.

(Concluded.)

By C. B. ROBINSON.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

10. **BOEHMERIA** Jacq.

KEY TO THE PHILIPPINE SPECIES OF BOEHMERIA.

- Glomerules axillary.
  - Alternate leaves or one of those of a pair very greatly reduced.
    - Leaves rugose, reticulations conspicuous, stipules persistent 1. *B. blumei*
    - Leaves very thin, not rugose, reticulations inconspicuous, stipules not persistent . . . . 2. *B. heterophylla*
  - Leaves of a pair not very unequal . . . . 3. *B. villosa*
- Glomerules spicate, sometimes also axillary.
  - Leaves alternate, spikes paniculately branched . . . . 4. *B. nivea*
  - Leaves opposite, spikes simple except in *B. celebica*.
    - Stipules 8 to 13 mm long, spikes usually distinctly exceeding leaves and petioles.
      - Leaves coriaceous, densely pubescent on both surfaces 5. *B. multiflora*
      - Leaves at most chartaceous, not densely pubescent on either surface.
        - Stipules linear-lanceolate, leaves rigid, spikes simple. 6. *B. platyphylla*
        - Stipules wider, leaves less rigid, spikes usually branched. 7. *B. celebica*
    - Stipules 3 to 6 mm long, spikes little or not exceeding leaves.
      - **Leaves lanceolate to elliptic, rigid** . . . . 8. *B. densiflora*
      - **Leaves wider, membranaceous** . . . . 9. *B. rupestris*

1. **Boehmeria blumei** Wedd. in DC. Prodr. 16¹ (1869) 204.

Margarocarpus heterophyllus Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 204.

Boehmeria heterophylla Blume Mus. Bot. Lugd.-Bat. 2 (1856) 204, non Wedd. in Arch. Mus. Paris 9 (1856) 351.

Pouzolsia heterophylla Miq. Fl. Ind. Bat. 1² (1859) 260.

LUZON, Province of Pampanga or Bulacan, *Cuming 731* (cotype): Province of Bulacan, Norzagaray, *Yoder 224:* Province of Rizal, Montalban, *Bur. Sci. 9546 Robinson;* Caysusot, *Phil. Pl. 58 Ramos:* Province of Bataan, Mount Mariveles, *Elmer 6656, Leiberg 6078:* Province of Laguna, Lake Colibato, *Bur. Sci. 9696 Robinson:* Province of Cavite, Silang, *For. Bur. 7640 Merritt.* MINDANAO, District of Davao, Sibulan River, *Elmer 11198:* District of Zamboanga, San Ramon, *Hallier s. n.:* Subprovince of Butuan, Talacogon, *Merrill 7278.*

The question of the priority between the publications of Blume and Weddell has already been fully discussed:[41] it may again be stated that pages 1 to 400 of Weddell's monograph are taken as antedating fascicle 13 of the second volume of the Mus. Bot. Lugd.-Bat., which begins on page 193. The two species to which the name *Boehmeria heterophylla* has been applied are closely allied, but the recent collections have not served to unite them.

In our collections, the longer leaves are sometimes opposite the shorter ones, more often nearly opposite, still more often definitely alternate with them, as they were originally described, but there are no correlating characters upon which to separate these races, and the matter has probably no systematic importance. The closest Asiatic alliance of the species seems to be *B. monticola* Bl., from Sumatra, but there are close American affinities, the plants above cited being very similar to *Pittier & Tonduz 11548*, from Costa Rica, unnamed, differing superficially only by having wider leaves.

Two northern collections, *Vanoverbergh 126*, Bontoc, and *Merrill 4432*, Cabayan, Benguet, well matching one another, find their closest alliance here. The structure of the stigma is as described in *B. villosa*, the apex of the ovary is narrowed to a glabrous beak continuous with the pubescent stigma. The place of junction with the stigma is the weakest and there is a tendency for a break to occur there, but the stigma is often present in well-advanced fruit. Father Vanoverbergh compares the fruiting glomerule to a *Fragaria*, and the Benguet specimen indicates a similar condition. They are rather easily distinguished by the eye from the collections cited under *B. blumei*, but the differences are difficult to define, the serration is not so coarse and the venation slightly different. Until a fuller series of collections is obtained, they may be doubtfully identified as *B. blumei*. A further point is their similarly to the so-called *Pouzolzia viminea* Wedd., at least as represented by *Ridley 14558*, Perak. Side by side comparison of the pistillate flowers, not quite conclusive, as the Malay ones were older, seemed to show the differences between *Boehmeria* and *Pouzolzia* to be present, in spite of very great general similarity. Material received while this paper is in press, *Bur. Sci. 12731 Fénix*, Sablan, Benguet, tends to unite these two collections with *B. blumei*.

Local names: *alibaguid* (Cavite); *alalasi* (Bontoc); *dapsic* (Benguet); *cagong* (Apo).

2. **Boehmeria heterophylla** Wedd. in Arch. Mus. Paris 9 (1856) 351, non *Margarocarpus heterophyllus* Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 204 (*B. heterophylla* Bl.).

Boehmeria cumingiana Bl. Mus. Bot. Lugd.-Bat. 2 (1856) 199.

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[41] This Journal 5 (1910) Bot. 471-473.

MINDORO, *Cuming 1561* (cotype): MINDANAO, District of Zamboanga, Zamboanga, *Merrill 5468*.

Endemic.

3. **Boehmeria villosa** sp. nov.

Boehmeria blumei Merr. in Philip. Journ. Sci. 3 (1908) Bot. 404, non Wedd. l. c.

Boehmeriae blumei admodum similis, sed differt foliis oppositis haud valde inaequimagnis; glomerulis axillaribus, monoicis vel dioicis, perianthio pistillifero tridentato, piloso, ovario longe acuminato, stigmate filiforme uno latere piloso: foliis ovatis, basi rotundatis emarginatis, margine dentatis, apice acuminatis, pagina superiore scabris, subtus petiolisque sericeo-villosis.

Monoecious and dioecious: glomerules axillary, those from opposite leaves often confluent or nearly so, up to 1 cm in diameter, sessile: staminate flowers subtended by oblanceolate to obovate bracts 1.5 to 3 mm long, the pedicels varying with the stage of development to 3 mm in length; perianth deeply 4-parted, the segments ovate, acuminate, ciliate, 1 to 1.5 mm long; filaments about 2 mm long; anthers 0.5 mm long: pistillate glomerules with the bracts and pedicels as in the staminate; perianth free from the ovary but closely inclosing it, remaining membranaceous, strongly narrowed above the ovary and surrounding its beak, 3-toothed, 2 to 2.5 mm long, pilose on the back and especially at the apex; ovary ellipsoid, compressed, about 1.2 mm long, at the apex contracted into a beak about two-thirds its length, the beak narrowed to a slender point and continuous with a filiform stigma over 2 mm long and pilose along one side.

Stems woody at the base, branching at the base and widely or slightly above, more or less angled, increasingly villose-tomentose toward the apex: leaves opposite, the petioles of those of a pair distinctly unequal, of mature leaves about 1 to 1.5 cm and 2 to 2.5 cm respectively, lamina subchartaceous, ovate, the opposing similar and unequal in size, but never greatly reduced, the larger 9 to 10 cm long, 3.5 to 4.5 cm wide, the smaller 5 to 7 cm long, 2.5 to 3.5 cm wide, all inequilateral at the rounded slightly emarginate entire base, the margins with acute or obtuse often acuminate teeth, the apex gradually contracted into an acumen 2 to 3 cm long; upper surface flat or somewhat rugose, appressed-pubescent, scabrous, under surface and petioles densely villose-tomentose: stipules lanceolate or narrowly oblong-lanceolate, slenderly long-acuminate, up to 7 mm in length or on the branchlets shorter, scarious on the margins, pilose along the middle.

BATANES ISLANDS, Batan Island, Santo Domingo de Basco, *Bur. Sci. 3754 Fénix* (type), *Bur. Sci. 3227 Mearns;* Sabtan Island, *Bur. Sci. 10176 McGregor*.

Allied to *B. sidaefolia* Wedd., but easily recognized by its woody stem, pubescence, the stouter petioles, and the thicker leaves, having moreover a much longer pistillate perianth and wider stipules.

Much like this at first sight is a curious plant, *Marave 12*, from Lipa, Batangas, consisting of a woody stem with 4 attached branches: the leaves are opposite, subopposite and probably also alternate, some of the leaves of a pair are alike in size and shape with petioles of equal length, in other cases one leaf is as before, but the other is almost sessile and quite different in shape, being ovate and cordate instead of oval and rounded, but they are never nearly so reduced as in *B. blumei*. The plant more or less suggests *B. malabarica* Wedd., which Villar reported as common near Manila: we have no Philippine material of the latter.

Local name (Batan): *tangao*.

4. **Boehmeria nivea** Gaudich. in Freyc. Voy. Bot. (1826) 499.

Urtica nivea Linn. Sp. Pl. (1753) 985.

BATANES ISLANDS, Batan Island, *Bur. Sci. 3204 Mearns. For. Bur. 15284 Agudo*. LUZON, Manila, *Norm. Sch. s. n.*

Local name (Batanes): *hasu*.

Boehmeria nivea tenacissima Miq. Fl. Ind. Bat. 1^2 (1859) 253.

Urtica tenacissima Roxb. Fl. Ind. 3 (1832) 590.

Boehmeria tenacissima Gaudich. in Freyc. Voy. Bot. (1826) 500.

BATANES ISLANDS, Sabtan Island, *Bur. Sci. 10184, 10185 McGregor*. These are only distinguished from those cited under the species by the fact that the under surface of mature leaves is either destitute of tomentum or has it in more or less isolated patches; so far as these collections go, the leaves are neither larger nor longer-petioled: the nature of the plant was not noted. They are separately recorded only because of their distinct economic importance: although the treatment of specific limits is here deliberately more radical than that of Weddell, these five collections would otherwise be placed together without the difference being considered even worthy of comment.

5. **Boehmeria multiflora** C. B. Rob. in Philip. Journ. Sci. 3 (1908) Bot. 179.

LUZON, District of Bontoc, *Vanoverbergh 534:* Province of Benguet, Baguio, *Williams 1088:* Province of Nueva Vizcaya, Mount Dalemdim, *Bur. Sci. 8197 Ramos:* altitudes 1,200 to 1,600 M. The later collections are excellent matches for the type. On an extreme view, this might possibly be included in *B. platyphylla*, as it remotely resembles *B. scabrella* Gaudich., there placed by Weddell, Hooker, and Wright, but held distinct by Clarke. It is well distinct from it by its longer spikes with correspondingly numerous glomerules, by the differently-shaped, coriaceous, much more finely and closely serrated leaves. The number of veins should be corrected to read from 5 to 8 beyond the nerve, the difference being due to the omission of those which connect the nerve with the costa.

6. **Boehmeria platyphylla** Don Prodr. Fl. Nepal. (1825) 60.

LUZON, Province of Laguna, Nagcarlan, by roadsides and on walls, *Bur. Sci. 6086, 6539 Robinson*.

Apart from the fact that *B. weddelliana* Vidal seems to be quite the same as *B. densiflora* Wight & Arn., and that the latter is *B. platyphylla* var. *loochooensis* Wedd., this polymorphic species seems not to have been previously collected in the Philippines, and the plants cited do not exactly agree with the descriptions of any of the varieties. However, they seem to come between the typical species and Weddell's variety *macrostachya*, which Hooker[42] by synonymy includes in *B. platyphylla* proper, differing from the type mainly by the smaller glomerules, and from the variety, with which they therein agree, by the more erect spikes. For greater accuracy, a brief description will be appended. To be consistent with his idea of the limits of the species, Weddell should have used one of several earlier names, tenable both in *Urtica* and *Boehmeria* at the time of their publication. The species to which all of those antedating 1825 belong have been held distinct by later authors; except one from Oceania to which I find no recent reference, and there is at present no reason for displacing the accepted name. The distribution of the species according to Weddell and Hooker is India, Ceylon, China, Japan, Malaya, and tropical Africa.

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[42] Fl. Br. Ind. 5 (1888) 578.

Spikes simple, ascending, toward the apex often curved, sometimes outward, more rarely inward, 6 to 30 cm long, usually far exceeding the corresponding leaves; glomerules 4 to 5 mm in diameter, often confluent or nearly so, very numerous. Petioles of a pair of leaves often distinctly unequal, 7 mm to 5 cm long; lamina ovate or oblong-ovate, 8 to 14 cm long, 4 to 7 cm wide, base varying from cordate to nearly acute, margins serrate except at the base and the slenderly acuminate apex.

Local name: *lipang aso.*

7. **Boehmeria celebica** Bl. Mus. Bot. Lugd.-Bat. 2 (1856) 217.

Urtica celebica Bl. Bijdr. (1825) 492.

Boehmeria platyphylla var. *celebica* Wedd. in DC. Prodr. 16¹ (1869) 211.

MINDANAO, District of Davao, Todaya, at 1,200 m elevation, *Elmer 11306.*

Although this does not exactly agree with the descriptions, the teeth of the less oblong leaves being nearly regular, it seems so close that it has been at least provisionally identified with Blume's species, especially as the descriptions of that author and of Weddell differ somewhat and between them describe the Philippine plants, so far as they go, except as stated above.

Local name: *ramirami.*

Java, Celebes.

8. **Boehmeria densiflora** Hook. & Arn. Bot. Beechey Voy. (1841) 271.

B. weddelliana Vidal Rev. Pl. Vasc. Filip. (1886) 256.

B. platyphylla var. *loochooensis* Wedd. in DC. Prodr. 16¹ (1869) 213.

LUZON, District of Bontoc, *Vidal 1784, Vanoverbergh 269, Bur. Sci. 7003 Ramos, For. Bur. 16515, 16532 Curran & Merritt.*

The reduction was first made by Wright,[43] and is here followed. *Henry 37,* from Formosa, is an excellent match for the Philippine collections.

China, Riu Kiu Islands, Formosa, Hongkong.

9. **Boehmeria rupestris** sp. nov.

Subherbacea, humilis, ramis pubescentibus: glomerulis pistilliferis spicatis, spicis brevibus; perianthio breviter piloso, apice valde contracto, 4-dentato, ovario libero apice cornuto, stigmate continuo: foliis oppositis, paris subsimilibus ovalibus vel ovali-obovatis, basi subacutis vel rotundatis, margine acute serratis, apice breviter acuminatis, trinerviis; stipulis lanceolatis, acuminatis.

Pistillate glomerules about 4 mm in diameter, few, on spikes not exceeding 2 cm in length, approximate or confluent; perianth free from the ovary, membranaceous, slightly over 1 mm long, obovoid, at the apex greatly narrowed with 4 obscure teeth closely surrounding the base of the prolongation of the ovary, shortly pilose especially at the apex; ovary 0.7 mm long, at the apex contracted into a horn-like process 0.4 mm long, this continuous with a very slightly pilose stigma about 1 mm long.

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[43] Journ. Linn. Soc. Bot. 26 (1899) 484.

Plants 20 to 30 cm high, the stems slender, terete, slightly woody at the base, below slightly apically densely short-pubescent: leaves opposite, varying greatly in size but those of a pair similar, petioles densely pubescent, 1 to 3 cm long, or on reduced leaves still shorter, lamina membranaceous, oval or oval-obovate, 1.5 to 5 cm long, 8 to 30 mm wide, the base subacute to somewhat rounded, the margins except at the extreme base serrate, the serrations acute or acutely acuminate, the apex abruptly or somewhat abruptly contracted into an acute acumen 2 to 4 mm long, upper surface somewhat sparingly pilose, the under more densely pubescent on the veins, 3-nerved, with 2 or 3 additional slender veins; stipules lanceolate, acuminate, persistent, 3 to 4 mm long, pilose on the costa.

LUZON, Province of Benguet, Rio Trinidad, on rocks, *Bur. Sci. 5542 Ramos.* Allied to *B. gracilis* Wright, but differing in several characters.

SPECIES EXCLUDENDAE.

1. BOEHMERIA ARACHNOIDEA Walp. Nov. Act. Acad. Nat. Cur. **19** (1843) Suppl. **1**: 423.

Pouzolzia arachnoidea (Walp.) Wedd.

2. BOEHMERIA CYLINDRICA Willd. Sp. Pl. 4¹ (1805) 340.

This American species is reported by Walpers, l. c., as collected by Meyen at Jalajala on the northern shore of Laguna de Bay. The specimen appears not to be in the Berlin herbarium, at least under *Boehmeria.*

3. BOEHMERIA INTERRUPTA Willd. l. c. 342.

Fleurya interrupta Gaudich.

4. BOEHMERIA MALABARICA Wedd. in Arch. Mus. Paris **9** (1856) 355.

Reported by Villar, but not recently collected.

11. **POUZOLZIA** Gaudich.

KEY TO THE PHILIPPINE SPECIES OF POUZOLZIA.

Glomerules borne on an elongate terminal spike .... 1. *P. arachnoidea*
Glomerules axillary.
    Leaves serrate or dentate.
        Stipules lanceolate .... 2. *P. dentata*
        Stipules much wider, involucrating glomerules .... 3. *P. rubricaulis*
    Leaves entire .... 4. *P. zeylanica*

1. **Pouzolzia arachnoidea** Wedd. in DC. Prodr. **16**¹ (1869) 228.

Boehmeria arachnoidea Walp. in Nov. Act. Acad. Nat. Cur. **19** (1843) Suppl. **1**: 423.

Pouzolzia macrura Wedd. in Arch. Mus. Paris **9** (1856) 396.

Stachyocnide luzonica Blume Mus. Bot. Lugd.-Bat. **2** (1856) 228, *pl. 55.*

LUZON, Province of Ilocos Sur, San Quintin, *For. Bur. 5630 Klemme:* Province of Rizal, Montalban, *Phil. Pl. 30 Merrill, Bur. Sci. 9520 Robinson;* Antipolo, *Bur. Sci. 129 Foxworthy, For. Bur. 3142 Ahern's collector;* Morong, *Bur. Sci. 1439*

Ramos: Province of Batangas, De la Paz, *For. Bur. 7735 Curran & Merritt.* MINDORO, *Cuming 1492.*

Local names: *ramairamai* (Ilocos), *lagonoy* (Antipolo).

Endemic.

2. **Pouzolzia dentata** sp. nov.

Frutex vel arbuscula: glomerulis axillaribus, multifloris; floribus staminiferis tetrameris; perianthio pistillifero tubuloso, apice valde contracto 4-dentato, libero, ovario stigmati articulato: foliis alternis, petiolis inaequilongis, laminis coriaceis vel subcoriaceis, ovatis, ovalibus, vel lanceolatis, basi acutis vel subtruncatis, apice acuminatis, marginibus dentatis.

Glomerules 4 to 6 mm in diameter, axillary, usually containing both staminate and pistillate flowers: staminate perianth very deeply 4-parted, 1.5 mm long, acuminate; stamens 4, filaments 1.5 mm long; rudimentary ovary stipitate, apiculate, about 0.6 mm long, the perianth, filaments and rudimentary ovary pubescent: pistillate perianth free from the ovary, not becoming succulent, in fruit about 8-costate, pubescent, tubular, forming 4 short lanceolate teeth at the greatly narrowed apex; ovary glabrous, ovate, 0.8 mm long; the stigma articulated, linear, pubescent, deciduous, about 1.5 mm long.

A shrub or small tree, attaining 3 m in height, the branches densely pubescent, often very distinctly zigzag: leaves alternate, those on the smaller branchlets often much smaller and shorter-petioled than the rest but otherwise similar; petioles 5 mm to 5 cm long, lamina coriaceous or subcoriaceous, ovate, oval, or less often lanceolate, 2.5 to 10 cm long, 2 to 7 cm wide, the base subacute to rounded, the margins except at the base with obtuse or somewhat apiculate teeth, the apex contracted into a short acute acumen, trinerved, the nerves extending about two-thirds of the length of the lamina, with 3 to 5 additional veins, reticulations numerous and conspicuous at least on the under surface, upper surface pilose or glabrescent, often scabrous, under surface grayish-tomentose, the veins white- and brownish-pilose; stipules lanceolate, caudate, 6 to 8 mm long, densely pubescent.

LUZON, Province of Benguet, Pauai, *Merrill 4741* (type); Mount Pulog, *Merrill 6561, For. Bur. 18117 Curran, Merritt, & Zschokke:* Mount Tonglon (Santo Tomas), *Elmer 6531.*

Very different from any other Philippine species of the genus, apparently approaching nearest to *P. conglobata* Bl., but differing from it by the very characters mentioned by Weddell as distinctive of that species, since the fruiting perianth of *P. dentata* is shortly rostrate, and the stigma while proportionally short can hardly be called thick. There is a definite note on *Elmer 6531:* "fruits . . . . deeply set in a white fleshy pubescent receptacle:" but there is no reason to believe that the perianth also becomes fleshy: on moistening, it is somewhat inflated and shows the ribs more distinctly, but that is all.

Local name (Pulog): *nalui.*

3. **Pouzolzia rubricaulis** Wedd. in DC. Prodr. 16 ¹ (1869) 229.

Leptocnide rubricaulis Bl. Mus. Bot. Lugd.-Bat. 2 (1856) 194, *pl. 57*.

LUZON, Province of Benguet, Ambuklao to Daklan, *Merrill 4390*. This agrees in so many points with Blume's description and figure that in spite of the improbability of a Javan species being isolated in the Benguet region, the only characters upon which to base a separation are of such a nature that they can merely be discussed. Blume founded the genus *Leptocnide*, of which this species is the type, on the ground that the perianth is adnate to the ovary: Weddell evidently disbelieved this, or he would not have transferred the species to *Pouzolzia*. In the Philippine specimen, the perianth closely surrounds the ovary, but is not adnate to it, so far as can be determined from dried material. The leaves of the Philippine plant average smaller than those of the Javan, but attain a length of 4 cm, the color-notes hold good, so far as can be judged, the arrangement described for the flowers is probably also true, but many of the staminate have fallen.

Java.

4. **Pouzolzia zeylanica** Benn. Pl. Jav. Rar. (1838) 67.

Parietaria zeylanica Linn. Sp. Pl. (1753) 1052.

Parietaria indica Linn. Mant. (1767) 128.

Pouzolzia indica Gaudich. in Freyc. Voy. Bot. (1826) 503.

Urtica villosa Blanco Fl. Filip. (1837) 695, non Thunb. Fl. Japon. (1784) 70.

BATANES ISLANDS, Batan Island, *Bur. Sci. 3695 Fénix*. BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 3955 Fénix*. LUZON, District of Bontoc, Aluling, *Vanoverbergh 928*: Province of Tayabas, Casiguran, *Bur. Sci. 2989 Mearns*: Province of Nueva Vizcaya, Quiangan, *Merrill 152*: Province of Zambales, Subig, *Hallier s. n.*: Province of Pampanga, Bacolor, *Parker 40, 72, 77, 78*: Province of Rizal, Bosoboso, *Bur. Sci. 2664 Ramos*; Manila, *Loher 4966*, *Merrill 70, 71*, *Philip. Norm. Sch. 45 Canlas*: Province of Laguna, Calauan, *Cuming 590*; Los Baños, *Elmer s. n.*: Province of Camarines, *For. Bur. 12411 Curran*. POLILLO, *Bur. Sci. 6902, 6970 Robinson*. MINDORO, Pola, *Merrill 2458*; Baco, *Merrill 878*. MINDANAO, District of Zamboanga, Zamboanga, *Hallier s. n.*; Port Banga, *Bur. Sci. 11803 Robinson*: Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.*: District of Davao, Todaya, *Elmer 11020*.

The Philippine specimens of this polymorphic species show many variations, usually corresponding to those found in other countries, but with some additions. As the study of our material and of the literature has led me to the conclusion that they should be included under one species, the oldest specific name applied to it has been used. However, if the species were to be divided, it is probable that all of our plants would go rather with typical *P. indica* than with any of the varieties kept distinct as such by Weddell. The fruiting perianth has from 8 to 12 ridges, usually blunt, sometimes more acute, rarely rather faint. The chief variants are briefly discussed.

The Mindanao collections differ considerably from the others. One of the Zamboanga plants has unusually large, broadly lanceolate, opposite leaves; another is procumbent with small alternate, orbicular-ovate leaves, and the typical fruiting perianth of *P. indica*. The Apo and Lanao collections are alike and much more pubescent than any of the others, except in this and size they agree with those from Port Banga, all having the perianth-ridges weakly developed: about an equal number of the staminate flowers are pentamerous and tetramerous. The Casiguran specimen is remarkable for its height, about 3 m, and still more for the shining black achenes.

Local names: *tuia* (Pola); *cayut-coran* (Apo).

Tropical Asia and Malaya.

SPECIES EXCLUDENDAE.

1. POUZOLZIA HETEROPHYLLA Miq. Fl. Ind. Bat. 1^2 (1859) 260.

Boehmeria heterophylla Blume non Wedd., *Boehmeria blumei* Wedd. Miquel's synonymy is inaccurate.

2. POUZOLZIA PENTANDRA Benn. Pl. Jav. Rar. (1838) 64, *pl. 14*.

Here included as *Gonostegia pentandra* Miq.

3. POUZOLZIA VIMINEA Wedd. in DC. Prodr. 16^1 (1869) 228.

Credited to the Philippines by Villar,[44] but not known from recent collections. If Villar's plant is indeed *Urtica japonica* Blanco, the case is little improved, as Blanco's description is very imperfect, and affords no certainty of recognition. It agrees better with *Boehmeria blumei* Wedd. than with any other known species, but the habitat stated is objectionable.

12. GONOSTEGIA Turcz.

KEY TO THE PHILIPPINE SPECIES OF GONOSTEGIA.

Staminate flowers pentandrous.
  Upper leaves much smaller than the lower........................ 1. *G. pentandra*
  Upper leaves similar to the lower........................ 2. *G. hirta*
Staminate flowers tetrandrous.
  Erect; leaves 1.5 to 5 cm long, upper narrower........................ 3. *G. integrifolia*
  Prostrate; all leaves similar, 6 to 14 mm long........................ 4. *G. reptans*

1. **Gonostegia pentandra** Miq. Ann. Mus. Lugd.-Bat. 4 (1869) 302.

Urtica pentandra Roxb. Fl. Ind. 3 (1832) 583.

Pouzolzia pentandra Benn. Pl. Jav. Rar. (1838) 64, *pl. 14*.

Memorialis pentandra Wedd. in DC. Prodr. 16^1 (1869) 235^2.

Hyrtanandra pentandra Miq. Fl. Ind. Bat. 1^2 (1859) 261.

Gonostegia alternifolia Turcz. Bull. Soc. Imp. Nat. Moscou 19^2 (1846) 510.

G. oppositifolia Turcz. l. c.

LUZON, Province of Benguet, Cabayan, *For. Bur. 15969 Bacani:* Province of Nueva Vizcaya, Santa Fé, *Bur. Sci. 8226 Ramos;* Dupax, *Merrill 250:* Province of Nueva Ecija, *Cuming 1391.* BOHOL, *Cuming 1833.* MINDANAO, District of Davao, *Copeland 360, DeVore & Hoover 115, Elmer 11020 a.*

The genus is very doubtfully distinct from *Pouzolzia*, though certainly worthy of rank as a section. *Memorialis* was used in Wallich's catalogue as a generic name for two numbers, both retained by Weddell in this genus as three species, though according to Miquel the name was taken from Rumphius, who thereby intended *Pouzolzia indica*. It was given sectional rank by Bennett, in 1838, but was not effectively published as a genus until taken up by Weddell, in 1857. *Gonostegia* and *Hyrtanandra* are both older, and the former must be used, if the genus is held distinct: if made a section, *Memorialis* has priority.

Local name (Apo): *cayut-coran.*

India, Java.

2. **Gonostegia hirta** Miq. Ann. Mus. Lugd.-Bat. 4 (1869) 303.

Urtica hirta Blume Bijdr. (1825) 495.

Memorialis hirta Wedd. in DC. Prodr. 16^1 (1869) 235^6.

Pouzolzia hirta Hassk. Cat. Hort. Bogor. Alt. (1844) 80.

LUZON, District of Bontoc, *Vanoverbergh 250:* Province of Benguet, Mount Pulog, *Merrill 6516, Bur. Sci. 8826 McGregor, For. Bur. 16044 Curran, Merritt, & Zschokke:* Pauai, *Bur. Sci. 4771 Mearns;* Baguio, *Elmer 5771, Bur. Sci. 2495*

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[44] Noviss. App. (1880) 205.

Mearns, For. Bur. 970 Barnes. MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 13:* District of Davao, Todaya, *Elmer 11958.*

Local name (Apo): *sacati.*

India, Malaya, Australia.

3. **Gonostegia integrifolia** Miq. Ann. Mus. Lugd.-Bat. 4 (1869) 303.

Pouzolzia integrifolia Dalz. in Hook. Journ. Bot. 3 (1851) 134.

Memorialis integrifolia Wedd. in DC. Prodr. 16¹ (1869) 235⁸.

LUZON, District of Bontoc, *Vanoverbergh 533:* Province of Benguet, Twin Peaks, *Elmer 6388.*

The identification is not positive, no pistillate flowers or fruits being present, and there are some points of disagreement. The statement "foliis sessilibus amplexicalibusque insignis" holds true: the lowest leaves are ovate and shorter than several of the succeeding pairs, these attaining a maximum length of 5 cm, some or all subtending flowers, they then gradually decrease in width but less definitely in length, those near the apex being often as long as the lowest though shorter than the longest. The nerves give off a fairly conspicuous vein at their very base, the leaf therefore appearing 5-nerved. In some leaves there are less conspicuous outer nerves. The anthers number 4 or very rarely 5.

India.

4. **Gonostegia reptans** sp. nov.

Reptans, caespitosa, caulibus debilibus: glomerulis axillaribus; floribus staminiferis tetrameris; perianthio fructifero 8-costato, stigmate deciduo: foliis subsessilibus, oppositis, membranaceis, ovatis vel orbiculari-ovatis, apice obscure acuminatis, apicalibus haud diminutis.

Glomerules axillary, few-flowered: staminate perianth very deeply 4-parted, the segments oblong, abruptly or somewhat abruptly inflexed near the apex with a transverse crest of hairs along the flexure, when outspread about 2 mm long; filaments 2 mm long, anthers 1 mm long: pistillate perianth about 1 mm long, the deciduous pilose stigma about 1.5 mm long; fruiting perianth about 1.5 mm long, with 8 or rarely more nearly acute ridges, pilose toward the apex; achene jet-black or the lower part or all white, ovate in outline, apiculate, about 1.3 mm long.

Plants weak, prostrate, creeping, the stems much-branched, pilose: leaves subsessile, the membranaceous lamina ovate, orbicular-ovate, or somewhat narrower, 6 to 14 mm long, 3 to 8 mm wide, or even smaller, the apical as large as the lower, the base rounded or slightly emarginate, entire, the apex obscurely or somewhat obscurely forming an obtuse or subacute acumen of about one-third the length of the leaf, trinerved, the nerves extending the length of the leaf or often becoming faint toward the apex but not then at the lateral margins, the nerves connected with the costa by several delicate transverse nervules but with no additional primary veins, both surfaces pilose when young, when older sparingly so; stipules broadly ovate, about 0.5 mm long.

LUZON, Province of Benguet, Baguio, *Elmer 5828* (type); Sablan, *Elmer 6140.* A very distinct species, resembling in habit and in the fruiting perianth some of the prostrate forms of *Pouzolzia zeylanica,* but quite distinct from them in venation and in the staminate flowers.

13. CHAMABAINIA Wight.

Chamabainia cuspidata Wight Ic. **6** (1853) 11, *pl. 1981.*

Urtica squamigera Wall. Cat., nomen.

Boehmeria squamigera Wedd. in Ann. Sci. Nat. Bot. IV **1** (1854) 203, nomen.

Chamabainia squamigera Wedd. in DC. Prodr. **16**¹ (1869) 218; Merr. in Philip. Journ. Sci. **1** (1906) Suppl. 184.

LUZON, District of Lepanto, Mount Data, at 2,100 m elevation, *Merrill 4556*: Province of Benguet, Mount Pulog, at 3,000 m, *For. Bur. 16043 Curran, Merritt & Zschokke.* MINDANAO, District of Davao, Mount Apo, 1,725 m, *Elmer 11541.*

While there seems to be no doubt of the correctness of this identification, it must be pointed out that the nature of the stigma of the Philippine specimens is not accurately represented by figures 5 and 6 of Wight's plate. The apex of the ovary is narrowed into a short acumen at the apex of which is the capitate-fimbriate stigma: in dissecting dried flowers, this nearly always comes off with the perianth although the latter very loosely envelopes the achene; under the compound microscope, it seems to be articulated.

Local name (Apo): *palauway.*

Northern India and southwestern China to Ceylon.

14. DISTEMON Wedd.

Distemon indicus Wedd. in Arch. Mus. Paris **9** (1857) 551, *pl. 20, A,* (*indicum*).

LUZON, Province of Rizal, Morong, *Bur. Sci. 1430 Ramos;* Antipolo, *Bur. Sci. 11857 Robinson & Ramos.* Agrees closely with Weddell's and Hooker's descriptions, and with material so named from Assam. The name *Distemon* has twice been used for other genera, one of them older than that of Weddell, both of them regarded as synonyms. Its retention is in exact agreement with the Vienna Code, though admittedly inconsistent with the procedure here followed in such cases as *Debregeasia.*

Assam, Burma, Java.

15. CYPHOLOPHUS Wedd.

KEY TO THE PHILIPPINE SPECIES OF CYPHOLOPHUS.

Leaves often very large, upper surface scabrous, lateral veins 7 to 12, reticulations of under surface usually close and very conspicuous .... 1. *C. moluccanus*

Leaves medium-sized or small, upper surface not scabrous, lateral veins fewer, reticulations looser and less conspicuous.

- Lamina 4 to 12 cm long, acuminate; stipules 8 to 12 mm...... 2. *C. brunneolus*
- Lamina usually much smaller, not or barely acuminate, stipules 5 mm long. 3. *C. microphyllus*

1. **Cypholophus moluccanus** Miq. Ann. Mus. Bot. Lugd.-Bat. **4** (1869) 305.

Urtica moluccana Bl. Bijdr. (1825) 491.

Boehmeria moluccana Wedd. in Ann. Sci. Nat. Bot. IV **1** (1854) 201; Blume Mus. Bot. Lugd.-Bat. **2** (1856) 208.

Cypholophus macrocephalus Wedd. l. c. 198.

Cypholophus macrocarpus Index Kew. 317, sphalm.

LUZON, Province of Benguet, *Bur. Sci. 2848 Mearns;* Baguio, *Williams 1069, Elmer 5861:* Province of Zambales, Mount Pinatubo, *Bur. Sci. 2561 Foxworthy:* Province of Laguna, Los Baños, *Elmer s. n., Bur. Sci. 6730 Robinson:* Province of Tayabas, Infanta, *Bur. Sci. 9346 Robinson:* Lucban, *Elmer 9114.* NEGROS, Canlaon Volcano, *Merrill 6914.* MINDORO, Lake Naujan, *For. Bur. 6756 Merritt;*

Amnay River, *For. Bur. 11441 Merritt.* MINDANAO, Province of Misamis, Mataline Falls, *For. Bur. 3923 Hutchinson:* Lake Lanao, Camp Keithley, *Mrs. Clemens 468, s. n.:* District of Davao, Mount Apo, *Elmer 10865.*

Boehmeria moluccana both of Weddell and Blume was based on *Urtica moluccana* Blume, but Weddell afterwards rejected this specific name, apparently on the ground that his species differed from that of Blume, which he gave varietal rank under *C. macrocephalus.*[45]

Local names: *libasa* (Misamis), *salabugan* (Apo).

Sumatra to Hawaii.

2. **Cypholophus brunneolus** Elmer Leafl. Philip. Bot. 3 (1910) 896.

Frutex 2- ad 3-metralis, parce ramosus, caulibus admodum angulatis, apicem versus parce strigosis: glomerulis pistilliferis circiter 5 mm diametro; perianthio tubuloso-ventricoso, circiter 1 mm longo, ore valde contracto breviter bidentato sparse piloso, achenio approximato sed haud adnato, stigmate 0.7 mm longo, valde recurvato: petiolis oppositis, subaequilongis vel saepius inaequilongis, brevioribus 6 ad 12 mm, longioribus 15 ad 45 mm longis, laminis coriaceis vel rigide chartaceis, isomorphis et fere aequimagnis, ellipticis ad elliptico-obovatis, 4 ad 12 cm longis, 2 ad 5.5 cm latis, basi acutis, margine ima basi excepta serratis, apice breviter acuminatis, trinerviis, venis additis 4 ad 6; stipulis lanceolatis, 8 ad 12 mm longis.

NEGROS, Canlaon Volcano, *Merrill 6913.* MINDANAO, District of Davao, Mount Apo, *Elmer 11641* (type), *11587:* elevations 600 to 1,000 m.

Very distinct from *C. moluccanus;* more closely allied to the next, and among previously described species probably nearest to *C. lutescens* (Bl.) Wedd.

Local names (Apo): *ramirami, salabogan.*

3. **Cypholophus microphyllus** Elmer Leafl. Philip. Bot. 3 (1910) 895.

Suffruticosus, metralis, ramosus, ramulis dense pubescentibus: floribus pistilliferis ut in praecedente sed perianthio minute 4-dentato, glomerulis minoribus: paris petiolis subaequalibus vel saepius valde inaequalibus, 2 ad 12 mm longis, laminis rigidis ambabus obovatis subaequalibus, vel inaequalibus una obovata altera suborbiculare, 8 ad 40 mm longis, 8 ad 24 mm latis, basi acutis vel rotundatis, apice haud vel brevissime acuminatis, margine ima basi excepta serratis, trinerviis; stipulis circiter 5 mm longis, diu persistentibus.

MINDANAO, District of Davao, Mount Apo, at 1,800 m elevation, *Elmer 11588.* Somewhat like the preceding on a much reduced scale, but apparently quite distinct, though likely more closely allied to it than to any other species.

Local name: *ramirami.*

Villar[46] says that he had also seen *C. prostratus* Wedd. in Vidal's herbarium, from Tayabas. Checking over Vidal's own record of his Tayabas plants,[47] it is not unlikely that the species intended by Villar was *Boehmeria blumei* Wedd., whose styles are often rather short with a tendency to curve; moreover, Villar mentions that species as one which he had not seen.

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[45] See DC. Prodr. 16[1] (1869) 63, 217, 235[30]; Miq. l. c.

[46] Noviss. App. (1880) 205.

[47] Revis. Pl. Vasc. Filip. (1886) 255–259.

16. PIPTURUS Wedd.

KEY TO THE PHILIPPINE SPECIES OF PIPTURUS.

Stipules free; glomerules axillary, rarely also spicate.
  Leaves long-petioled except on small branchlets or reduced plants, their margins entire or more often coarsely dentate .... 1. *P. arborescens*
  Leaves short-petioled, their margins regularly finely serrate
    2. *P. mindanaensis*
Stipules united for about half their length, free at the apices; glomerules spicate, rarely also axillary.
  Both surfaces of leaf nearly same color; spikes usually solitary.
    Leaves elliptic or oblong to oval or obovate, abruptly acuminate
      3. *P. repandus*
    Leaves narrowly elliptic or narrowly oblong, gradually acuminate
      4. *P. succulentus*
  Under surface of leaf white-tomentose.
    Spikes usually fascicled; leaves coriaceous, oval or narrowly oval; woody vine .... 5. *P. discolor*
    Spikes usually solitary; leaves thinner, ovate to lanceolate; tree
      6. *P. argenteus*

1. **Pipturus arborescens** comb. nov.

Urtica arborescens Link Enum. Hort. Berol. 2 (1822) 386; Blanco Fl. Filip. ed. 2 (1845) 483; Naves in Blanco Fl. Filip. ed. 3 (1877) *pl. 371.*

Urtica baccifera Blanco Fl. Filip. (1837) 695, non Linn. Sp. Pl. ed. 2 (1763) 1398.

Pipturus asper Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 197.

BATANES ISLANDS, Batan Island, *For. Bur. 15295 Agudo.* BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 3998 Fénix;* Dalupiri, *Bur. Sci. 10107 McGregor.* LUZON, Province of Ilocos Norte, Pasuquin, *For. Bur. 13805, 13821 Merritt & Darling:* Province of Ilocos Sur, Baranas River, *For. Bur. 14082 Merritt & Darling:* District of Bontoc, *For. Bur. 10974 Curran, Vanoverbergh 125, 189, 757:* District of Lepanto, Balbalasan, *For. Bur. 5697 Klemme:* Province of Benguet, Mount Pulog, *For. Bur. 18119, 18210 Curran, Merritt, & Zschokke;* Sugpan, *For. Bur. 14102 Merritt & Darling;* Baguio, *Williams 1073, Elmer 8489, 8746:* Province of Union, Bauang, *Elmer 5615:* Province of Pangasinan, Agno, *Bur. Sci. 4839 Ramos:* Province of Bulacan, Norzagaray, *Yoder 147:* Province of Bataan, *Whitford 72, For. Bur. 2222 Meyer, Williams 325:* Province of Rizal, Bosoboso, *Merr. Dec. Phil. For. Fl. 214 Ahern's collector;* Antipolo, *Merrill 1631, Phil. Pl. 366 Ramos;* Pateros, *Bur. Sci. 9568 Robinson:* Manila, *Cuming 724, Ahern 712, Merrill 96, 98, Elmer 5509, Phil. Norm. Sch. 44, 152, 488, 489:* Province of Laguna, Los Baños, *Hallier s. n., Elmer s. n.:* Province of Batangas, Lipa, *Phil. Norm. Sch. 351:* Province of Tayabas, Atimonan, *Gregory 36;* San Isidro, *For. Bur. 5689 Kobbe:* Province of Camarines, Pasacao, *Ahern 154.* MINDORO, *Merrill 1221;* Pola, *Merrill 2241:* Macaulig, *For. Bur. 5362 Merritt;* Aglubang River, *For. Bur. 12023 Merritt;* Bongabong River, *For. Bur. 3723 Merritt.* NEGROS, Himugaan River, *Whitford 1635;* Cadiz, *Bur. Sci. 7343 Celestino;* Talisay, *For. Bur. 15175 Tanosa;* Luzuriaga, *Bur. Sci. 9947 Robinson.* CEBU, Toledo, *Bur. Sci. 1783 McGregor.* MINDANAO, Province of Surigao, *Ahern 665:* Lake Lanao, Camp Keithley, *Mrs. Clemens 240:* District of Zamboanga, Lunsugan, *Ahern 619:* District of Cotabato, *Bur. Sci. 11559 Robinson.* BASILAN, Isabela, *Bur. Sci. 9982 Robinson.* PALAWAN, Puerto Princesa, *Bur. Sci. 246 Bermejo;* Canina River, *Bur. Sci. 769 Foxworthy.*

Variable in the size, shape, and pubescence of the leaves. The Palawan collections are least typical, *Bur. Sci. 769* departing rather definitely from the type, but linking with it through some of the Bataan collections: *Bur. Sci. 246* has both axillary and spicate glomerules, this also occurring on the Lanao collection; they are otherwise quite typical. The stipules are decisive as separating this from *P. repandus*, which is otherwise quite distinct.

Link's description, for a copy of which I am indebted to Lieut.-Col. Prain, is as follows: "Caule pubescente, foliis longe petiolatis ovate-lanceolatis acuminatis subcrenatis supra scabris subtus mollissime pubescentiis trinerviis, floribus glomeratis axillaribus. Hab. in Manila ♄ C. Elegans species. Pet. 2–3′ longi. Folia lamina 5–6′ longa 2′ 2″ lata. Nondum bene floruit." Plants suggested by the name are species of *Laportea*, *Leucosyke*, and *Pipturus asper*. The inflorescence rules out the first, moreover Link obviously handled the leaves of living plants and his silence is significant: the glomerules of *Leucosyke* are peduncled, though shortly, and the petioles are always much shorter than the length given: to the identification with *Pipturus asper*, there are no obstacles. Blanco correctly interpreted Link's species, and Naves, in turn, figured the right plant as *U. arborescens* Blanco. It is almost unbelievable that with its extreme distribution in the Philippines, it should not have a wide range elsewhere, but the only other report is from Borneo.[48]

Local names: *dalonot* (Manila, Mindoro, Bosoboso), *dalunot* (Antipolo, Pangasinan), *dulunot* (Manila), *calonut* (Tayabas), *arandong* (Babuyanes), *aramay* (Batanes), *agandong* (Ilocos Norte), *danguel*, *anyangeu* (Bontoc), *moliungol* (Lepanto), *ngungoy* (Benguet), *agdalamay*, *hinadung* (Mindoro), *gindaramay*, *jindaramay*, *gimasgimas* (Negros), *handalamay* (Surigao, Zamboanga), *gunoi* (Cotabato), *candamay* (Palawan).

2. **Pipturus mindanaensis** Elmer Leafl. Philip. Bot. 3 (1910) 898.

Praecedenti valde affinis, sed differt foliis ellipticis, oblongis, vel rarius elliptico-lanceolatis, brevius petiolatis, marginibus numerosius dentatis.

MINDANAO, District of Davao, Mount Apo, at 1,125 m elevation, *Elmer 10520*.

With all the variation in the leaves of *P. arborescens*, in shape, size, serration, and pubescence, this seems quite distinct, but the differences are somewhat difficult to define. The leaves of *P. arborescens* vary in shape from lanceolate to nearly orbicular, becoming sometimes on plants from exposed situations nearly elliptic; those of *P. mindanaensis* are elliptic, oblong, or sometimes elliptic-lanceolate; the margins of the former are often entire, but more often with very coarse teeth very slightly cutting the margin, where these are most numerous the number rarely reaches 30: in *P. mindanaensis*, the leaf is entire for about one-fourth of its length from the base, the teeth are numerous, about 45 or 50 on ordinary leaves, and not nearly as long across their bases as in the former: the petioles of *P. mindanaensis* range up to 18 mm in length, but are usually distinctly shorter than this, whereas in *P. arborescens*, they are most often 4 to 5 cm long, but range all the way from 1.5 to at least 10.5 cm; they are still shorter on reduced leaves which are often present upon normal plants or upon plants from exposed localities. These are the only two species of *Pipturus* with free stipules, their nearest ally, *P. albidus* (Hook. & Arn.) Wedd., having them nearly free. They are usually 3 to 4 mm long in *P. arborescens*, ovate and narrowly acuminate, but are sometimes lanceolate and narrower and up to 7 mm: in *P. mindanaensis*, they agree with the latter type. The parent species tends to vary in many directions: *P. mindanaensis* has probably progressed sufficiently far to be held distinct.

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[48] Rolfe in Journ. Linn. Soc. Bot. 21 (1884) 298.

Local name: *amirami*.

3. **Pipturus repandus** Wedd. in Arch. Mus. Paris 9 (1857) 448.

Urtica repanda Blume Bijdr. (1825) 501.

P. ellipticus Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 197.

LUZON, Province of Benguet, *Bur. Sci. 3420 Mearns*; Trinidad, *Elmer 5882*; Baguio, *Elmer 8726*, *Williams 1078*, *1089*: Province of Nueva Vizcaya, Santa Fé, *Bur. Sci. 8228 Ramos*: Province of Rizal, San Isidro, *Phil. Pl. 282 Ramos*: Province of Laguna, Mount San Cristobal, *Copeland s. n.*; Mount Maquiling, *Loher 6954*: Province of Tayabas, *Cuming 759*; Lucban, *Elmer 7786*.

The four last collections are very similar: the more northern specimens rather constantly differ by having stouter petioles and rachises, and rigid leaves often pubescent on the under surface especially when young. Moreover, some of the spikes are leaf-bearing, until it becomes difficult to discriminate between them and leafy branches with axillary glomerules. Similar collections may have been the basis for the crediting to the Philippines, by Villar, of *P. argenteus* (Forst.) Wedd. *P. repandus* has great external similarity to *Oreocnide trinervis* (Wedd.) Miq., but is easily distinguished by the inflorescence and flowers.

Sumatra, Java, Celebes.

4. **Pipturus succulentus** Elmer Leafl. Philip. Bot. 3 (1910) 897.

P. repando (Bl.) Wedd. valde affinis, differt foliis angustioribus, sensim acuminatis, nervis plerumque longioribus saepe in acumen ipsum protractis.

MINDANAO, District of Davao, Baruring River, at 1,050 m elevation, *Elmer 10739*.

This is very definitely a woody vine; the Philippine plants identified as *P. repandus* have either this habit, or are at most low, greatly branching shrubs. The tendency of the leaves of Philippine *P. repandus* is to be wider than as described for that species, they measuring 5.7 to 10.5 cm long, 3 to 5.8 cm wide, and being nearly uniform in shape are regularly about twice as long as wide. Those of *P. succulentus*, on the other hand, are from 6.5 to 12.5 cm long, 1.5 to 3 cm wide, four times as long as wide: immature leaves showing the same proportions have been omitted in the measurements of both species; in both, also, much smaller leaves are present on the spikes. The nerves of the leaves of *P. succulentus*, on one or both sides, more often extend to the base of the acumen, in some cases even into it, less often they vanish before reaching it. The stipules are slightly longer than in *P. repandus*, about 5 mm, and are not so deeply cut, about half-way to the base, but the margin of difference is slight. The spikes are more often solitary, but sometimes fascicled.

Local name: *ramee*.

5. **Pipturus discolor** sp. nov.

Scandens: glomerulis spicatis, spicis fasciculatis, quam folia brevioribus quam petioli multo longioribus: ramis ramulisque ferrugineo- et albido-tomentosis dein glabrescentibus; foliis ovalibus vel anguste ovalibus, rigidis, subintegris, trinerviis, discoloribus.

Spikes in fascicles of two or three, rarely solitary, 4.5 to 7 cm long, the rachises pubescent like the stem; glomerules sessile, paired, the pairs 3 to 4 mm in diameter, up to 5 mm apart, stigmas not included in these measurements: pistillate perianth about 1 mm long, more or less pubescent, conforming to the shape of the ovary and adnate to it, the apex very shortly and obscurely 4- or 5-lobed; stigma 3 to 4 mm long, densely pubescent except at the extreme base, deciduous.

A woody vine, widely branching, the branches terete or toward the apex obscurely obtusely angled, the bark brown, glabrescent near the base, elsewhere densely covered with short white and ferruginous pubescence; petioles and lamina of leaves variable in length, apparently without system, the former 3 to 16 mm long, pubescent like the branches, the lamina coriaceous, rigid, oval or narrowly oval, 4.2 to 12 cm long, 24 to 67 mm wide, the base varying from acute to subcordate, the margins entire or subentire, the apex merely rounded or short-acuminate, 3-nerved, the nerves extending at least four-fifths of the length of the lamina, often almost to its apex, with numerous anastomosing veins connecting the costa and the nerves, conspicuous on the under surface, but with only one or two primary veins and they near the apex, the reticulations slightly pubescent and brownish in color, forming a strong contrast to the dense white tomentum of the interstices, upper surface of young leaves-pilose, at length glabrous, except on the principal veins; stipules united for half their length, nearly 4 mm long, white-pubescent, early deciduous.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 676* (type): District of Davao, Sibulan River, *Elmer 11776*.

Closely allied to *P. argenteus* (Forst.) Wedd., differing in the habit,[19] the shape, apex, and somewhat in the pubescence of the leaves, and the fascicled spikes. It is curious that three out of our six species should be scandent, whereas of the eight enumerated by Weddell only *P. rotundifolius* (Poir.) Wedd., from Mauritius, is so described; also, that while we have two closely allied species with free stipules, the only other that approaches them should also be the closest to them in other characters.

Local name (Apo): *ramerame*.

6. **Pipturus argenteus** Wedd. in DC. Prodr. 16^1 (1869) 235.[19]
Urtica argentea Forst. Prodr. (1784) 65.
LUMBUCAN ISLAND, (near Balabac), *Merrill 7185, Phil. Pl. 401 Merrill.*
Sumatra to Australia and the Pacific Islands.

17. OREOCNIDE Miq.

Leaves pinnately veined .... 1. *O. rubescens*
Leaves distinctly 3-nerved .... 2. *O. trinervis*

1. **Oreocnide rubescens** Miq. Ann. Mus. Lugd.-Bat. 4 (1869) 306.
Urtica rubescens Bl. Bijdr. (1825) 506.

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[19] Fl. Austral. 6 (1873) 185.

Villebrunea rubescens Bl. Mus. Bot. Lugd.-Bat. 2 (1856) 167.

V. frutescens Merr. in Bull. (Philip.) For. Bur. 1 (1903) 19, non Bl. Mus. Bot. Lugd.-Bat. 2 (1856) 168.

LUZON, Province of Tayabas, Lucban, *Elmer 9237:* Province of Sorsogon, Sorsogon, *Elmer 7313, For. Bur. 10518 Curran.* MINDORO, Amnay River, *For. Bur. 11462 Merritt;* Subaan River, *For. Bur. 6900, 11380 Merritt.* NEGROS, Baliw, *For. Bur. 11214 Everett;* Mount Canlaon, *For. Bur. 17412 Curran.* LEYTE, Palo, *Elmer 7116;* Tacloban, *For. Bur. 12442 Danao.* MINDANAO, Subprovince of Butuan, Waloe, *Merrill 7285:* District of Zamboanga, Tetuan, *Ahern 365;* Sax River, *Williams 2129:* Lake Lanao, Camp Keithley, *Mrs. Clemens 59, 334, 338, s. n.:* District of Davao, Mount Apo, *Ahern 685.* The stipules of some of the above are as much as 12 or 13 mm long.

With regard to the generic name: *Oreocnide* Miquel was published on page 39 of "Plantae Junghuhnianae," which appeared in March, 1851, according to Flora 34 (21 May 1851) 302, though Miquel himself gives the date as 1852, in his later[60] claim for the validity of the name. *Villebrunea* appeared as the generic name of two species in Gaudichaud's Bot. Voy. Bonite, and has been adopted by Weddell and nearly all subsequent writers. The plates were issued, according to Weddell, between 1839 and 1846, but were not accompanied by explanations or descriptions: the former appeared subsequently, in 1866, too late to affect the point at issue. The true place of publication must then be that where it was taken up by a subsequent author, namely by Weddell in Ann. Sci. Nat. Bot. IV 1 (1854) 195. Miquel's name thus has priority. Only the first of Gaudichaud's plates belongs to the genus as now understood.

Local names: *liasim* (Sorsogon); *baquidbaquid* (Negros); *alamang* (Zamboanga); *calulit* (Apo).

Java, Celebes.

2. **Oreocnide trinervis** Miq. Fl. Ind. Bat. 1^2 (1859) 270.

Villebrunea trinervis Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 196.

BATANES ISLANDS, Batan Island, *Bur. Sci. 10200 McGregor, For. Bur. 15293 Agudo.* BABUYANES ISLANDS, Babuyan Island, *Bur. Sci. 3910 Fénix.* LUZON, Province of Ilocos Norte, Bangui, *For. Bur. 13855 Merritt & Darling:* Province of Benguet, Lusod-Pompon trail, *For. Bur. 15767 Curran & Merritt;* between Baguio and Sablan, *Williams 1466:* Province of Zambales, Mount Pinatubo, *Bur. Sci. 2594 Foxworthy:* Province of Bataan, Mount Mariveles and Lamao River, *Williams 491, For. Bur. 195 Barnes, For. Bur. 2645, 3001 Meyer, Elmer 6978, For. Bur. 7380 Curran:* Province of Rizal, San Isidro, *Phil. Pl. 281 Ramos:* Province of Laguna, Los Baños, *Elmer s. n.;* Mount Maquiling, *For. Bur. 7792 Curran & Merritt, Lijano s. n.:* Province of Tayabas, *Cuming 777* (type collection); Atimonan, *Whitford 640;* Buenavista Mountain, *For. Bur. 10307 Curran.* NEGROS, Himugaan River, *For. Bur. 4297 Everett.*

Local names: *kasuy* (Batan Island); *giudcranaon* (Ilocos).

Formosa.

The place of origin of *Villebrunea crenulata* Gaudich. Bot. Voy. Bonite *pl. 92,* was doubtfully stated by Weddell, in 1854, to be the Philippines. Although he continued to cite this plate in the generic description of *Villebrunea,* even in 1869, he reduced the species to his *Urera sandwicensis,* confining its range to the Hawaiian Islands.[61]

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[60] Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 306.

[61] DC. Prodr. 16^1 (1869) 92, 235.[80]

18. **DEBREGEASIA** Gaudich.

Debregeasia angustifolia sp. nov.

D. longifolia Rolfe in Journ. Bot. 23 (1885) 215, et Auct. Philip., non Wedd. in DC. Prodr. 16^1 (1869) 235.

Monoica vel dioica: glomerulis geminatis, pedunculatis; perianthio pistillifero ovarium arcte amplectente sed haud ei adnato, ore valde contracto, brevissime dentato, sub fructu baccato achenium laxe continente: foliis alternis, coriaceis, anguste lanceolatis vel anguste oblongo-lanceolatis; stipulis lanceolatis vel ovatis, apice bifurcatis, pilosis.

More often monoecious with the staminate glomerules toward the apices of the branchlets: peduncles solitary or paired, up to 5 mm long, bracted at the base and with more or less deciduous bracteoles about 1 mm long, pilose, usually once forked, the secondary peduncles very shortly forked at the apex, the glomerules therefore paired and approximate: staminate flowers nearly sessile, somewhat exceeding the triangular-ovate ciliate bracteoles; perianth deeply 4-parted, about 1 mm long, the segments ovate, pilose; anthers about 0.3 mm long: pistillate receptacles 3 to 4 mm in their longer diameter, the pairs together up to 7 mm in diameter; pedicels up to 1 mm long; perianth closely covering the ovary but easily separable from it, about 0.7 mm long, greatly contracted and minutely toothed at the apex; stigma penicillate-capitate, subpersistent; fruiting perianth red, fleshy, up to 1.5 mm long, the achene hardly longer than the ovary and therefore loosely contained by the perianth.

A shrub, 2 to 5 m high, the branchlets and younger parts of the branches densely white- and brown-pilose: leaves alternate, petioles densely pubescent, 2 to 15 mm (usually 6 to 8 mm) long, the lamina coriaceous, narrowly lanceolate or narrowly oblong-lanceolate, 2.5 to 13 cm long, 8 to 24 mm wide, the base obtuse or rounded, more often slightly emarginate, the margins except at the extreme base densely serrate, the teeth short, obtuse or acute, the apex gradually acuminate; trinerved, the nerves extending about half the length of the lamina, with 5 to 7 additional conspicuous veins and other very short ones at the apex, the reticulations numerous, conspicuous on the under surface; upper surface rugose, sparsely or somewhat densely pilose, under pilose on the veins and white- or gray-tomentose between them; stipules lanceolate or ovate, 7 mm long, bicarinate, bifurcate, pilose on the forks, keels, between them and the margin, and sometimes also along the middle.

LUZON, Province of Abra, Mount Paraga, *Bur. Sci. 7106 Ramos*: District of Lepanto, Balbalasan, *For. Bur. 5695 Klemme*; Balili, *Merrill 4641*: Province of Benguet, Mount Pulog, *For. Bur. 18104, 18147 Curran, Merritt, & Zschokke*; Imogen-Nozo trail, *For. Bur. 14198 Merritt*; Baguio, *Elmer 5922*, *Topping 112*, *Williams 1551* (type), *Bur. Sci. 5761 Ramos*, *Bur. Sci. 12891 Fénix*: District of

Bontoc, Bauco, *Vanoverbergh 1010*. The leaves of the two last are less coriaceous than the type, so that this may not be a valid differentiating character, otherwise, they are as described above.

This species has hitherto been identified as *D. longifolia* (Burm.) Wedd., but on comparison with material of that species from Sikkim, *Craib 575, 594*, and of *D. edulis* Wedd. from China, *Henry 10536, 12378 A*, it seems much more distinct from either than they are from one another, and of the two slightly nearer *D. edulis*. It differs distinctly from both in the coriaceous narrower leaves, and further from *D. longifolia* by its smaller glomerules and less-branched inflorescence.

The pistillate perianth of *Debregeasia* is always described as adnate to the ovary: not only in the Philippine species but in the Asiatic it seems to be easily separable, whereas in fruit the achene has hardly increased in size and is very loosely inclosed. The structure of the flowers of the Philippine and Asiatic material is identical.

Debregeasia is one of the names taken up by Weddell from Gaudichaud: in the Bot. Voy. Bonite, there is merely a plate, the explanations not appearing till 1866, the genus therefore dating from Weddell's monograph, 1857. There is an undoubted older name, *Morocarpus*[52] Sieb. & Zucc., 1846: it is not used here, because there is an older *Morocarpus*.[53] The latter is regarded as a synonym of the still older *Chenopodium* Linn., and according to the Vienna Code, should be taken up for the genus. *Leucocnide* Miq.,[54] 1851, is generally cited as another synonym, but it is a mixture of two genera, the first two species being *Leucosyke*: it is here held to be typified by the species now known as *Leucosyke capitellata*.

Local name (Lepanto): *lamag*.

19. ASTROTHALAMUS gen. nov.

Flores pistilliferi numerosissimi sessiles in receptaculo pedunculato varie lobato margine revoluto congesti, perianthio arcte adnato glabro, stigmate capitato: inflorescentiae staminiferae admodum similes sed receptaculo multo minus evoluto, floribus tetrameris, perianthio alte 4-partito, puberulo, acuminato, intus basi breviter lanato, ovario rudimentario stipitato, glabro. Genus Sarcochlamydi et Maoutiae affine, hac differt inflorescentiis, illa admodum inflorescentiis et perianthio pistillifero arcte adnato, ambabus floribus staminiferis tetrameris, ovario rudimentario haud lanato. In insulis Mariannis, Mindanao, et Borneo inventum est. Typus: Maoutia reticulata Wedd.

Astrothalamus reticulatus comb. nov. Plate III.

Maoutia reticulata Wedd. in DC. Prodr. **16** ^{1} (1869) 235.[31]

M. planitora C. B. Rob. in Philip. Journ. Sci. **3** (1908) Bot. 180.

MINDANAO, District of Zamboanga, Sax River, *Williams 2079*; San Ramon, *Copeland s. n.* BORNEO, Sarawak, Matang, *Hewitt s. n.*; Kuching, *Moulton s. n.*

The species was originally collected by Née, both in the Marianne Islands and in Mindanao, and was described by Weddell, with doubt expressed as to its generic position, on account of the absence of pistillate inflorescence. This but not the staminate is present on the more recent Mindanao material, and the remarkable nature of the inflorescence led to its too hasty publication as new, doubt being again expressed with regard to the genus. Subsequent comparison of a fragment of the later species with Weddell's type, by Professor Lecomte of the Muséum d'Histoire Naturelle, Paris, left no doubt of their identity. The first collection from Borneo also had pistillate inflorescences, identical with the Philippine, and I am greatly indebted to Mr. J. C. Moulton, of the Sarawak Museum, for a large quantity of material with inflorescences of both kinds.

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[52] Abh. Akad. Muench. **4** ^{2} (1846) 218.

[53] Adans. Fam. Pl. 2 (1763) 261.

[54] Pl. Jungh. 36.

At first sight and even under the lens, no pistillate perianth can be seen: under the compound microscope it appears as a single row of cells, closely adhering to the achene except in some cases at the apex and still less frequently at the base. The inflorescence has already been fully described, it suggests that of *Sarcochlamys* and the minute flowers have much of the aspect of those of that genus, which is its nearest alliance; however, the perianth differs. The staminate inflorescences show a tendency in the same direction as the pistillate, but do not form a receptacle; the flowers are tetramerous, not a character of either *Maoutia* or *Sarcochlamys*, and the rudimentary ovary is not concealed by the woolly indumentum of the perianth; these are matters of secondary importance. In these rudimentary ovaries, the gelatinous perianth is quite distinct. One receptacle, otherwise pistillate, has a single lobe staminate.

Marianness, Borneo.

20. MAOUTIA Wedd.

Maoutia setosa Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 194.

M. platystigma Wedd. l. c.

LUZON, District of Bontoc, *Vanoverbergh 591:* Province of Benguet, Dongon, *Bur. Sci. 5340 Ramos;* Sablan, *Elmer 6203;* Baguio, *For. Bur. 956 Barnes:* Province of Pangasinan, Buena Vista, *Bur. Sci. 8289 Ramos:* Province of Batangas, *Cuming 1441* (2 cotypes of *M. platystigma* Wedd.): Province of Laguna, Mount Banajao, *For. Bur. 7861 Curran & Merritt.* NEGROS, Luzuriaga, *Bur. Sci. 9929 Robinson.* MINDANAO, District of Davao, Sibulan River, *Elmer 11777.*

Dr. F. Gagnepain of the Muséum d'Histoire Naturelle, has kindly compared *Bur. Sci. 8289* with the type of *M. setosa, Callery 30*, also from the mountains of Pangasinan, and finds it a perfect match, and has further indicated the differences between it and the type of *M. platystigma*, also in their herbarium. Upon careful study of the series of specimens now at hand, there seems no good character left upon which to maintain a separation. If that were done, the Banajao and Batangas collections would be the only ones under *M. platystigma*, for their leaves are usually widest near the middle, the stipules are less pubescent, and the tomentum of the under surface of the leaves less snowy. Leaf-texture does not assist, for the Banajao leaves are nearly coriaceous, and those of *Bur. Sci. 5340* are membranaceous, whereas these collections otherwise exhibit the reverse alliance. But on several collections, leaves are present, some of which are widest near the base, and others about the middle or even above the middle. This is especially true of the two southern collections. The character drawn from the stigma is also unreliable. In one way, the Apo plant is the most distinct of all, having wider stipules.

Local names: *labay* (Bontoc), *dálonog* (Benguet), *alayan* (Apo).

Endemic.

Maoutia reticulata Wedd., of which *M. planitora* C. B. Rob. is a synonym, is here made the type of a new genus.

21. LEUCOSYKE Zoll. & Mor.

KEY TO THE PHILIPPINE SPECIES OF LEUCOSYKE.

Stipules large, membranaceous, 7.5 to 10 cm long.................................... 1. *L. nivea*

Stipules fairly large, 3 to 4 cm long, never softly tomentose on the outer surface.

  Stipules lanceolate or elliptic-lanceolate; veins connecting midvein with nerves sharply bent .... 2. *L. mindorensis*

  Stipules elliptic; veins connecting midvein with nerves merely arched or nearly straight .... 3. *L. aspera*

Stipules subchartaceous, 14 to 32 mm long, densely soft-pubescent, the nerves very conspicuous .... 4. *L. hispidissima*

Stipules not more than 2.5 cm long, externally strigose or appressed-strigose.

  Stipules membranaceous, oblong-lanceolate.

    Stipules united for at least two-thirds their length.

      Leaves up to 12 cm long, veins between midvein and nerves more crowded, usually 2 to 3 mm apart, rarely forked.

        Leaves widest at or above middle.................. 5. *L. magallanensis*

        Leaves widest below middle .... 6. *L. brunnescens*

      Leaves 17 to 22 cm long, the veins less crowded, except near the base usually at least 5 mm apart, often forked. 8. *L. negrosensis*

    Stipules free for at least three-fourths of their length...... 7. *L. ovalifolia*

  Stipules chartaceous, lanceolate.

    Leaves trinerved .... 9. *L. capitellata*

    Leaves falsely 4-nerved .... 10. *L. quadrinervia*

The genus *Leucosyke* was published in 1845 or 1846. Synonymous with it is *Missiessya*, a name attached to plate 93 of the Bot. Voy. Bonite, without description. The latter was taken up by Weddell, in 1854, at which time he included *Debregeasia* in his conception of the genus; in 1869, he accepted *Leucosyke*. *Leucocnide* Miq., 1851, is also partly *Leucosyke* and partly *Debregeasia*, but the more typical species belong to the former.

1. Leucosyke nivea sp. nov.

L. candidissima Merr. in Philip. Journ. Sci. **3** (1908) Bot. 130, non Wedd. in DC. Prodr. $\mathbf{16}^{1}$ (1869) 235.[86]

L. candidissimae affinis, sed differt stipulis multo longioribus et minus pubescentibus, capitulis majoribus, et foliorum basi acutorum venatione.

Peduncles mostly paired, 10 to 17 mm long, the fruiting heads 12 to 15 mm in diameter: flowers as in *L. candidissima*.

Trees 4.5 to 7.5 m high, the branchlets terete, longitudinally striate, annulate and conspicuously marked by the scars of fallen leaves, more or less appressed-pubescent or glabrescent, internodes about 1 cm long: petioles 3 to 5 cm long, appressed-pubescent; lamina broadly elliptic or oblong-elliptic, 21 to 27 cm long, 10 to 13 cm wide, the base acute or subacute, the margins shallowly dentate except in the basal third, the apex shortly and acutely acuminate; strongly 3-nerved, the nerves continuing about six-sevenths of the length of the lamina, primary veins above the middle of the lamina, about 6 on each side, becoming approximate at the apex, veins between midvein and nerves numerous, about twice as many as the stronger ones between the nerves and the margin, other venation comparatively inconspicuous; upper surface densely covered with short stiff appressed hairs, the veins of the under surface with similar pubescence, the intervening portions very densely covered with very snowy tomentum; stipules ovate, amplexicaul, 7.5 to 10 cm long, bifid at the apex for about 1 cm, acute, appressed-pubescent on the outer surface.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.* More closely allied to *L. candidissima* than to any other species, but well distinct in the characters noted: its tomentum is much more snowy than in the only specimen of that species in this herbarium.

2. **Leucosyke mindorensis** sp. nov.

Arbuscula, ramulis tomento ferrugineo et pilis albidis brevibus obtectis: foliis subcoriaceis, lanceolato-ovatis vel oblongo-ellipticis, basi acutis vel subrotundatis, margine ima basi excepta dentatis, apice acuminatis vel fere acutis, trinerviis; stipulis lanceolatis, 3 ad 5 cm longis: pedunculis pistilliferis longiusculis, capitulis majusculis, multifloris.

Peduncles of pistillate capitula mostly in pairs, when mature 2 to 2.5 cm long, the capitula 12 to 14 mm in diameter: flowers very numerous, subsessile, the perianth forming 5 very short obtuse or acuminate lobes; ovary flattened, obovoid, about 0.8 mm long; stigma capitate, very shortly penicillate.

A tree 3 m high, its stem 10 cm in diameter, the branchlets somewhat longitudinally ribbed, annulate and marked with the scars of fallen leaves, ferruginous-tomentose and with scattered white hairs more conspicuous toward the apex and upon the petioles and the nerves of the under surface of the leaves, internodes variable in length: petioles 2 to 4 cm long; lamina subcoriaceous, narrowly ovate or oblong-elliptic, 18 to 21 cm long, 7 to 10 cm wide, the margins dentate except at the extreme base, the apex acuminate for about one-third the length or less or merely gradually contracted to an acute point, 3-nerved, the nerves extending about two-thirds the length of the lamina, additional primary veins 5 or more, veins between the midvein and the nerves numerous, straight or nearly so for three-fifths or two-thirds of their length and then abruptly but obtusely bent downward, usually but not always forking at or near the bend, the veinlets slender but conspicuous by their light-brown color against the white tomentum of the under surface, from which only the principal veins project; stipules submembranaceous, lanceolate, amplexicaul, 3 to 5 cm long, very shortly bifid at the apex, their outer surface pubescent like the stem.

MINDORO, Amnay River, at 600 m elevation, *For. Bur. 11461 Merritt.* Possibly closely allied to *L. sumatrana* (Bl.) Miq., which has sessile capitula and longer nerves. The next species, which is very similar, can be distinguished by its much less sharply curved or nearly straight veins, both these and the veinlets projecting above the tomentum, and by the fact that both leaf-surfaces are much more roughly pubescent.

3. Leucosyke aspera sp. nov.

Arbuscula (?), foliis longe petiolatis, subcoriaceis, ovalibus, basi acutis, margine ima basi excepta acute serratis, apice abrupte acuminatis, trinerviis; stipulis ellipticis, bifidis, acutis, longiusculis: capitulis breviuscule pedunculatis, multifloris.

Pistillate peduncles solitary or paired, less than 1 cm long, the capitula 7 to 8 mm in diameter; flowers numerous, subsessile, the 5-lobed perianth 0.4 mm long, and the ovary, 1 mm long, both longer than in the preceding species; stigma short, capitate, very shortly penicillate.

Branchlets somewhat angled, the scars of fallen leaves and of stipules less conspicuous than in the two preceding species, the branchlets, petioles especially near their insertion in the lamina, upper surface of young leaves and the nerves and veins of the under surface at all ages more or less densely covered with rather stiff spreading white hairs 1 to 2 mm long: petioles 32 to 92 mm long, comparatively slender; lamina rigid, subcoriaceous, oval, 18 to 22 cm long, 9 to 13 cm wide, the base acute, the margins with numerous small closely-set acute teeth, these less definite in the basal fourth and wanting at the base, the apex abruptly contracted into a triangular acute acumen about 1 cm long; trinerved, the nerves continuing for about four-fifths of the length of the lamina, additional primary veins 5 or 6, the numerous veins connecting the midvein with the nerves straight or slightly arched, rarely forking, but frequently having intermediate veins near the nerves arising from the veinlets which connect these veins with one another; nerves, and veinlets definitely extending beyond the dull-bluish-white tomentum of the under surface and strongly contrasting with it in color, both surfaces when mature scabrous, the upper glabrescent with very numerous cystoliths; stipules chartaceous, elliptic, 3.5 to 4 cm long, bicostate, many-nerved, bifid at the apex, pilose without on the costas, ciliate, substrigose on the outer surface.

LUZON, Province of Albay, Mount Mayon, *Bur. Sci. 2915 Mearns* (type). SIBUYAN, Magallanes, *Elmer 12261*. Not to be confused with *Missiessya aspera* Wedd., which is *Leucosyke capitellata* var. *celtidifolia* Wedd., and has never been transferred to *Leucosyke*: if that form were upheld as a species, the priority of the names would be doubtful, as Gaudichaud's name is attached to a plate only, while *M. aspera* has the oldest verbal description. The present use of *L. aspera* will prevent any future difficulty, and it is improbable that *M. aspera* will ever receive more than varietal rank, although it is usually easily recognizable from *L. capitellata*.

4. **Leucosyke hispidissima** Miq. Fl. Ind. Bat. 1² (1859) 265.
Missiessya hispidissima Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 195.
LUZON, Province of Benguet, Baguio, *Elmer 5906, 6083, 8972, Williams 1017.*

This species has been a great stumbling-block for all workers upon Philippine botany, and there is no certainty that its present identification is correct. The type was collected by Callery, "in ins. Manillae montibus Igorrotes." This is very likely to have been not far from the present Baguio. The two points in the description that are most notable are the length of the petioles, given as 3 to 6 cm, and of the stipules 1.5 cm. There is but one collection in this herbarium that will nearly agree with this, *For. Bur. 4316 Everett*, from Negros, and there are many reasons for believing it not to be the true *L. hispidissima*. There are already three collections of historic interest in connection with the name, the type, *Cuming 1672* from Panay, and *Vidal 1801* from Mount Mayon, the two last identified by Vidal as *L. hispidissima*. I have not seen any of these, but suspect the Mayon plant to be the species here called *L. aspera*, and *Cuming 1672* to be *L. magallanensis* Elmer, a species very similar to the one here identified as *L. hispidissima* but with different serration. No one of all our species agrees exactly with the description, and the present one especially differs in the length of the petioles, which reach only 13 mm and are usually much shorter, the stipules vary from 14 to 32 mm; the pistillate peduncles are 8 to 20 mm long, and the capitula are 8 to 11 mm in diameter.

From an evolutional standpoint, it seems evident that our species, with the exception of *L. nivea*, have developed from *L. capitellata*, as shown by the great contrast between the number of collections that must still be referred to that species and the very few whose characters differ sufficiently to cause them to be considered worthy of separate recognition. It seeming evident that the preceding species could most readily be keyed out from the rest by the stipules, a large number of those of all species have been examined, with the result that they have been found to yield very constant characters, the plants thus segregated being of such a nature that their specific distinctness would always have been suspected, though in the absence of any definite character they would more likely have been identified as *L. capitellata?* Only as between *L. brunnescens* and *E. ovalifolia* is the validity of their use doubtful. The stipules are regularly bifid for a rather definite distance from the apex, perhaps they would be better described as united up to a similar point, and are 2-costate, these costas being produced: in one case, typified by *Merrill 481*, from Culion, they are parted for about three-fourths of their length or on other stipules of the same plant entirely to the base, being then 1-costate. It is somewhat difficult to group these characters for the purposes of a key.

In addition to these costas, there are several additional more slender veins nearly parallel to them: these vary greatly in the ease with which they can be seen, but the differences are probably in all cases merely of degree, and the underlying basis appears to be the texture of the stipules. This will explain its use in the key, the difficulty in application being that the thicker costa is likely to be taken as an index of the whole. In *L. capitellata*, for example, the texture is thicker than in the present species, although the latter exceeds most of the others, and the veins other than the costas are usually quite inconspicuous. It is to be remembered that this is not an artificial character by which certain collections have been separated, but that the differences indicated appear to hold good for plants that would have been suspected of different identity for other reasons. As this character has not hitherto been given much attention, it will not be surprising if some of the species here described as new, should prove identical with forms hitherto considered varieties of *L. capitellata*. On the other hand, there are various forms, otherwise differing from typical *L. capitellata*, but to a less extent, which agree with it in the nature of their stipules; these are here retained in that species, except in the case of *L. quadrinervia*, where the venation is very different. Unfortunately, the stipules are deciduous, but can almost always be found at the apex, being apt to differ in size according to age.

5. **Leucosyke magallanensis** Elmer Leafl. Philip. Bot. 2 (1910) 677.

Frutex, 5 m altus: glomerulis staminiferis centimetralibus, pedunculis 7.5 mm longis, floribus tetrameris: petiolis subcentimetralibus, laminis rigide chartaceis, oblongis vel oblongo-obovatis, 8 ad 11.5 cm longis, 3.5 ad 5 cm latis, basi subacutis ad subrotundatis, margine basi excepta serratis, serraturis brevibus valde incurvo-apiculatis strigosis, apice breviter acuminatis, trinerviis, venis saepissime 5 additis, supra sparsim adpresse strigosis, scabris, subtus in venis strigosis, interstitiis tomentosis; stipulis oblongo-lanceolatis, submembranaceis, circiter 15 mm longis, apice bifidis, extus strigosis.

SIBUYAN, Patoo River, at 300 m elevation, *Elmer 12282*. Most closely allied to the species here called *L. hispidissima*, but distinguished by its smaller and less-veined stipules, more shortly acuminate leaves, and other characters.

6. **Leucosyke brunnescens** sp. nov.

Glomerulis staminiferis mediocriter pedunculatis, capitulis pistilliferis subsessilibus: foliis in specimine staminifero longiuscule in specimine pistillifero brevius petiolato, laminis rigide chartaceis, basi rotundatis, margine basi excepta dentatis vel crenatis, dentibus acutis vel saepe apiculatis, pagina superiore scabris, subtus in nervis strigosis; stipulis membranaceis, apice bifidis, oblongo-lanceolatis, 9 ad 15 mm longis.

Dioecious: staminate glomerules 6 to 7 mm in diameter, on peduncles 4.5 to 8 mm long, the flowers bracteate, on pedicels attaining 2 mm in length, perianth deeply 5-parted, the segments oblong-lanceolate to ovate, 1.2 to 1.5 mm long, acuminate; filaments 1.5 mm long, anthers 0.6 mm long; rudimentary ovary lanate: pistillate capitula subsessile, about 5 mm in diameter; flowers sessile; perianth about 1 mm in diameter rather obscurely forming 4 or 5 lobes of which one is more distinct than the others; achenes laterally compressed, obliquely ovate, about 1.5 mm long; stigma penicillate-capitate.

Shrubs or small trees, 2 to 3 m high, the branches annulate, densely substrigose toward the apex, becoming glabrate: petioles of the staminate specimen 1.5 to 3 cm long, of the pistillate 6 mm or less, the lamina rigidly chartaceous, inequilateral, ovate or elliptic-ovate, 7 to 10.5 cm long, 3 to 5 cm wide, the base rounded, the margins serrate or almost crenate, the teeth shallow, acute or apiculate, the apex shortly and acutely acuminate, upper surface scabrous, pilose or substrigose, the under pilose on the yellowish veins with gray tomentum in the interstices, trinerved with 3 to 5 additional primary veins, the nerves continuing three-fourths the length of the lamina or farther on the narrower side; stipules membranaceous, together oblong-lanceolate, free for about 3 mm at the apex, in all 9 to 15 mm long.

LUZON, Province of Cagayan, Maunan, *Bur. Sci. 7821 Ramos* (type, pistillate); Province of Ilocos Sur, Sugpan, *For. Bur. 14046 Merritt & Darling*. This is very close in general appearance and in nearly all of its characters to *L. ovalifolia*, and can only be told with certainty by means of the stipules, which are connate except at the apex, in contrast to *L. ovalifolia* where they are separate throughout the greater part of their length, often becoming free, probably through pressure from the expanding leaves. Had not the nature of the stipules proven so characteristic in all the other cases, these two species would not have been held distinct. They nearly agree with the description of *L. hispidissima*, but are very distinct from the species here called by that name.

7. **Leucosyke ovalifolia** sp. nov.

Frutex: pedunculis pistilliferis solitariis vel geminis, breviter pedunculatis: foliis mediocriter petiolatis, rigide membranaceis, saepissime ovalibus, basi rotundatis vel obtusis, margine basi excepta acute serratis, apice breviter acuminatis, trinerviis; stipulis liberis anguste lineari-lanceolatis, vel basi solum connatis, membranaceis, usque ad 15 mm longis.

Pistillate peduncles solitary or paired, 2 to 4 mm long, the capitula about 5 to 6 mm in diameter; flowers subsessile, the perianth about 1 mm in diameter, oblique, with one rather conspicuous and 2 or 4 other obscure lobes; ovary obliquely ovate, laterally compressed, about 1.4 mm long; stigma penicillate-capitate.

Shrub, about 2.5 m high, the branchlets annulate and scarred, with deciduous appressed or spreading white substrigose pubescence, internodes usually short: petioles 1.5 to 3 cm long, sparingly strigose, lamina rigidly membranaceous, oval or nearly oval, 6 to 9 cm long, 4 to 6 cm wide, the base rounded or obtuse, the margins except at the base serrate, the teeth acute or apiculate, hair-tipped, the sinuses broadly rounded, the apex shortly acuminate, usually abruptly; trinerved, the nerves continuing for at least three-fourths the length of the lamina, additional primary veins 2 or 3, all venation impressed on the upper surface, projecting from the under, upper surface appressed-strigose and usually somewhat scabrous, veins of under surface strigose, the interstices grayish- or white-tomentose; stipules membranaceous, free and unicostate, triangular-lanceolate, or united for less than one-fourth of their length and bicostate, up to 1.5 cm in length including the long-exserted costas.

LUZON, Province of Zambales, Subig, *Hallier s. n.* CULION, *Merrill 481* (type). PALAWAN, Iwahig, *Merrill 706*. Very distinct from *L. capitellata*, especially in the nature of its stipules, but by them alone separable from *L. brunnescens*, from which it may not prove distinct.

8. **Leucosyke negrosensis** sp. nov.

Capitulis pistilliferis majusculis longiuscule pedunculatis: petiolis mediocribus vel longis, laminis rigide chartaceis, elliptico-oblongis, ovalibus, vel ovali-ovatis, basi rotundatis vel brevissime acuminatis, margine dentatis vel crenatis, apice acuminatis, trinerviis; stipulis oblongo-lanceolatis, membranaceis, 2 ad 2.5 cm longis.

Pistillate capitula 8 to 9 mm in diameter on appressed-strigose peduncles 1 to 1.7 cm long; flowers shortly pedicelled; perianth about 0.8 mm in its longest diameter, nearly oval in outline, hardly lobed, achene obliquely ovate, 1.3 mm long; stigma penicillate-capitate.

Shrub or small tree 8 m high, the branches and branchlets appressed-strigose, internodes 2 to 6 cm long; petioles 1.5 to 5.5 cm long, lamina elliptic-oblong, oval, or oval-ovate, 17 to 22 cm long, 7 to 12 cm wide, the base very shortly acuminate or rounded, the margins except at the base serrate or crenate, the teeth shallow but long, acute or apiculate, the apex shortly and acutely acuminate; trinerved with 4 to 6 additional primary veins, the veins between the midvein and the costa more or less sharply bent and often forked, upper surface and veins of the under appressed-strigose, scabrous, interstices of the under gray-tomentose; stipules membranaceous, oblong-lanceolate, 2 to 2.5 cm long, bifid at the apex for one-third of their length, appressed-strigose.

NEGROS, Province of Negros Occidental, Pioc River, in dense forest, *For. Bur. 4316 Everett;* differing from *L. capitellata* in the stipules, the longer petioles, and the size and outline of the leaves.

9. **Leucosyke capitellata** Wedd. in DC. Prodr. 16^{1} (1869) 235.^{87}

Urtica capitellata Poir. Suppl. 4 (1816) 227.

Leucosyke alba Zoll. & Mor. Syst. Verz. Ind. Arch. (1845) 100.

Missiessya fagifolia Gaudich. Bot. Voy. Bonite *pl. 93;* Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 195.

Urtica sp. Blanco Fl. Filip. (1837) 696.

LUZON, District of Bontoc, *Vanoverbergh 365:* Province of Benguet, *For. Bur. 941 Barnes:* Province of Bataan, *Williams 69, 262, Merrill 2543, 2544, Elmer 6665, Whitford 288:* Province of Rizal, *Loher 4985, Dec. Philip. For. Fl. 88 Ahern's collector, For. Bur. 1863 Ahern's collector:* Province of Laguna, *Elmer s. n., Alberto s. n., For. Bur. 7766 Curran & Merritt, Phil. Pl. 392 Ramos, For. Bur. 11939 Tamesis, Bur. Sci. 10993 Ramos:* Province of Tayabas, *Whitford 657, Merrill 2032, 2884, Elmer 7849, For. Bur. 6698 Kobbe, Ritchie 32 m:* Province of Camarines, *Ahern 113, For. Bur. 14259 Aguilar:* Province of Albay, *Bur. Sci. 6233 Robinson:* Province of Sorsogon, *For. Bur. 10560 Curran.* POLILLO, *Bur. Sci. 10391 McGregor, Bur. Sci. 6894 Robinson.* MASBATE, coll. unknown. LEYTE, *Elmer 7326, 7337, For. Bur. 12446 Danao.* CEBU, *Cuming 1766, For. Bur. 6438 Espinosa.* NEGROS, *Whitford 1641, For. Bur. 11241 Everett, For. Bur. 7402 Danao, For. Bur. 15143 Tanosa, Bur. Sci. 9950 Robinson.* MINDORO, *McGregor 132, Merrill 990, 995, 1180, For. Bur. 3676, 3691, 3725, 6831 Merritt, Whitford 1377.* MINDANAO, District of Zamboanga, *Ahern 361, 383, 617, Williams 2109:* Lake Lanao, *Mrs. Clemens 136:* District of Davao, *Copeland 436, Elmer 10656.*

BASILAN, *Hallier s. n., For. Bur. 4024 Hutchinson.* BOHOL, *Cuming 1848.* PALAWAN, *Bur. Sci. 726 Foxworthy.*

These collections are by no means uniform, but no definite characters can be found by which to separate them, although several varieties could be distinguished, intergrading with one another. It is noteworthy that the Mindanao collections, as well as a majority of those from the Visayas, and a smaller proportion of those from Luzon and Mindoro, have much shallower serrations than the rest; all necessary intergrades occur. One variety is so different from the rest that the collections under it are cited separately, the leaves are much smaller and more coriaceous, but there are again intermediate forms, and it is not here held to be specifically different.

Leucosyke capitellata var. celtidifolia Wedd. in DC. Prodr. 16¹ (1869) 235.**

Missiessya celtidifolia Gaudich. Bot. Voy. Bonite *pl. 93;* Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 195.

Missiessya aspera Wedd. in Ann. Sci. Nat. l. c.

Leucosyke celtidifolia Miq. Fl. Ind. Bat. 1² (1859) 266.

LUZON, Province of Cagayan, *Cuming 1350:* Province of Ilocos Norte, *For. Bur. 19044 Darling:* District of Bontoc, *Vanoverbergh 264, Bur. Sci. 5982 Ramos, For. Bur. 10987 Curran, For. Bur. 16525 Curran & Merritt;* Province of Benguet, *Williams 1018:* Province of Nueva Vizcaya, *For. Bur. 14857 Darling:* Province of Pangasinan, *Merrill s. n.:* Province of Pampanga, *Loher 4988, For. Bur. 19422 Curran:* Province of Bataan, *Whitford 1149, Elmer 6976.* This is a more northern variety; where its range overlaps that of the species, the elevation is greater.

Local names: *alalasi, ararasi, arasi* (Bontoc); *anagasi* (Cebu, Zamboanga); *anugas* (Sorsogon); *banato* (Tayabas); *bajebaje* (Negros); *bunkilan* (Basilan); *dalunoadios* (Negros); *gasigasi* (Zamboanga); *hanlagasi, hilagasa, hilagasi, lagasi* (Mindoro); *jinlagasi, ilagasi* (Negros); *jinagasi* (Camarines); *leasin, layasin* (Tayabas); *ysis maya* (Rizal).

Java to the Moluccas and Formosa.

10. **Leucosyke quadrinervia** sp. nov.

Frutex vel arbuscula, ramulis plus minusve flexuosis: foliis mediocriter petiolatis, basi valde inaequilateralibus, marginibus crenatis, apice acuminatis, spurie quadrinerviis; stipulis chartaceis, lanceolatis, admodum parvis.

Dioecious: staminate glomerules on peduncles 1 cm long or less, comparatively few-flowered, 5 mm in diameter; flowers shortly pedicelled, perianth 1.5 to 2 mm long, 4-parted, the segments lanceolate, acuminate, strigose on the outer surface near the apex; filaments 1.5 to 2 mm long; rudiment of ovary lanate: pistillate peduncles 3 to 6 mm long, the capitula 6 to 7 mm in diameter; flowers shortly pedicelled, perianth-lobes very short, triangular; ovary oblique, 1.4 mm long, pubescent at the apex; stigma short, capitate.

Shrubs or small trees, attaining 7 m in height, the branches and branchlets sometimes strikingly zigzag-flexuose, striate, annulate, scarred, often glaucous; petioles 4 to 10 mm long, the rigid lamina strongly inequilateral, especially at the base, elliptic to ovate, 4.5 to 11.5 cm long, 2 to 5.5 cm wide, or still longer on young shoots, the base usually very shortly acuminate, the margins entire near the base and on the narrower side sometimes for nearly half its length, elsewhere shallowly dentate or crenate, the apex shortly and acutely acuminate, falsely 4-nerved, the basal outer vein from the nerve of the wider side arising almost or quite at the insertion of the petiole and equally prominent with the nerves throughout its length, nerves not spreading widely from the midvein, that of the narrower side continuing about six-sevenths the length of the lamina, of the wider side two-thirds or more, additional primary veins 2 or 3, veins connecting the midvein and nerves numerous, arched or nearly straight, the reticulations conspicuous; the scabrous upper surface glabrous except on the veins, the veins and nerves of the under surface shortly appressed-pubescent, the interstices gray-tomentose; stipules chartaceous, lanceolate, bifid at the apex, about 1 cm long, with very short and dense white appressed pubescence.

BATANES ISLANDS, Sabtan Island, *Bur. Sci. 3752 Fénix* (type): Batan Island, *For. Bur. 15276 Agudo*, *Bur. Sci. 3653 Fénix*. BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 4134 Fénix*. The Forestry Bureau collection, received after this description had been written, is probably from a young shoot, having larger and thinner leaves, five in number, of which four show the characteristic venation, the fifth is definitely trinerved. This is one of a series obtained through the energy of Mr. H. M. Curran, to illustrate the economic plants of this most northern group of the Philippines, and contains the note that it is used as food for goats.

Local names: *bujuan* (Sabtan); *vuhuan* (Batan), probably mere variants in spelling of the same sound.

ADDENDA.

In the brief time that has elapsed between the correction of the proofs of the two parts of this paper, two important series of collections have been made, throwing additional light on several species. In addition, duplicates of Loher's Philippine collections have been received from Kew, and a valuable set from British India, both containing suggestive material of this family. Moreover, J. J. Smith's recent paper[66] on the woody *Urticaceae* of Java has arrived, and his lucid descriptions have made it possible to compare many of our species with much greater certainty. However, I have found no reason to doubt the accuracy of the segregations made herein, except in the case of *Debregeasia angustifolia*. Even there, the Indian and Chinese collections, already referred to, and Gaudichaud's and Wight's plates, leave no other course open than that which has been taken. I have not followed Mr. Smith in replacing the name *Boehmeria platyphylla* Don by a new combination based upon *Urtica caudata* Burm., because *Boehmeria caudata* Sw. is to me a sufficient obstacle to such a course. If Weddell's idea of the limits of the species and his synonymy

[66] Koord. & Val. Bijdr. Boomsort. Jav. 12 (1910) 672–753.

were to be accepted entire, the oldest valid name seems to be *B. japonica* (Linn. f.) Miq. But all recent authors segregate some one or more of his varieties as species, with little agreement. Mr. Smith, for example, considers *B. platyphylla* var. *clidemioides* Wedd., with the synonyms cited, as two species, one in a very different alliance, yet C. H. Wright [56] adheres to Weddell's treatment.

In addition to the following, several collections of less interest have been obtained.

LAPORTEA Gaudich.

Laportea rigidifolia C. B. Rob. in Philip. Journ. Sci. **5** (1911) Bot. 483.

LUZON, Province of Benguet, Sablan, *Bur. Sci. 12748 Fénix.* The leaf-apex, which on previous collections was only uninjured on a single leaf and that a small one, is here well preserved and is rather characteristic. The petiole is over 11 cm long, the lamina about 57 cm long, and the apex is gradually contracted to a somewhat falcate acute point, the acumen, if there can be said to be one, being about 16 cm long. The plant is noted as very poisonous.

Local names: *lupa a nalabaga* (Il.); *addalateng* (Ig.).

PILEA Lindl.

Pilea calcicola C. B. Rob. l. c. 493.

LUZON, Province of Rizal, Montalban, *Loher 6902,* topotype and very typical.

LECANTHUS Wedd.

Lecanthus wightii Wedd. in Ann. Sci. Nat. Bot. IV **1** (1854) 187.

The full-sized leaves of *Smith & Cave 2797,* Sikkim, so named, have at least one hundred times the area of the largest on Doctor Copeland's collection from Mount Apo. Those of our other specimens are intermediate in size, but all much smaller than the mature ones of the Indian collection.

ELATOSTEMATOIDES C. B. Rob.

Elatostematoides manillense (Wedd.) C. B. Rob. l. c. 501.

LUZON, Province of Rizal, Angilog, *Loher 6915:* Province of Laguna, Calauan, *Bur. Sci. 12367 McGregor.* Neither is typical, the former being coarse and pubescent, the latter unusually delicate.

ELATOSTEMA Forst.

Elatostema sikkimense C. B. Clarke in Journ. Linn. Soc. Bot. **15** (1876) 124.

From *Smith & Cave 858,* Sikkim, it would seem that to the characters separating this species from *E. luzonense,* may be added the stoutness of the spurs of the staminate bracts, this making them more conspicuous than those of the Philippine species, although in the latter they are well developed.

Elatostema simulans C. B. Rob. l. c. 519.

LUZON, Province of Benguet, Sablan, *Bur. Sci. 12754 Fénix:* Province of Laguna, Calauan, *Bur. Sci. 12357 McGregor.* It is to be noted that the collections identified with the type of this species have pistillate receptacles only.

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[56] Journ. Linn. Soc. Bot. **26** (1899) 487.

Elatostema obovatum Wedd. in Ann. Sci. Nat. Bot. IV 1 (1854) 190.

LUZON, Province of Laguna, Calauan, *Bur. Sci. 12370 McGregor*. This collection is an excellent match for *Cuming 628*, from the same locality. Staminate receptacles are still wanting, but there is little doubt that it has been placed in the correct alliance, as shown by its similarity to *E. delicatulum* Wedd., also represented by *Bur. Sci. 12361 McGregor*, Calauan, and to *E. glaucescens* Wedd., also represented by *Bur. Sci. 12334 McGregor*, Calauan.

Elatostema viridescens Elmer Leafl. Philip. Bot. 1 (1908) 285.

LUZON, Province of Benguet, Baguio, *Bur. Sci. 12752 Fénix*. The specimens are sterile, and have smaller leaves and shorter stipules than the more southern collections, but are otherwise very similar.

Elatostema hookerianum Wedd. in Arch. Mus. Paris 9 (1857) 309.

R. E. Cooper 692, Sikkim, suggests an alliance for *E. apoense* Elmer, but at least the young staminate bracts are more corniculate, the plants glabrous, and the leaves smaller and of somewhat different outline and texture than in the Apo plants.

Elatostema obtusiusculum C. B. Rob. l. c. 537.

LUZON, Province of Benguet, Sablan, *Bur. Sci. 12755 Fénix*. As critical collections as could be desired to test the validity of two of the species proposed as new have been obtained, and the one just cited has distinctly smaller leaves than the type with a corresponding decrease in the number of marginal teeth, bringing it close in both these respects to *E. brongniartianum* Wedd. This makes the characters stated in my key insufficient for certain determination, but still suggestive; those in the text, drawn from venation and pubescence, seem quite reliable.

Elatostema plumbeum C. B. Rob. l. c. 535.

LUZON, Province of Benguet, Baguio, *Bur. Sci. 12757 Fénix*. Again, the leaves are smaller than in the type, and the smaller ones can hardly be called distinctly acuminate. With these qualifications, the species still seems distinct and to be separable as previously noted.

Elatostema variegatum C. B. Rob. l. c. 538.

LUZON, Province of Benguet, Sablan, *Bur. Sci. 12756 Fénix*.

Elatostema sp.

LUZON, Province of Benguet, Sablan, *Bur. Sci. 12753 Fénix*. This differs from any Philippine or other species with which I am acquainted, but is left undescribed, as no staminate receptacles are present, and the alliance, although probably with *E. longipedunculatum* Elmer, is not obvious.

PROCRIS Commers.

Procris lagunensis C. B. Rob. l. c. 506.

PHILIPPINES, without further locality, *Loher 6945*. The leaves are somewhat narrower than the type, and render the validity of the species increasingly doubtful.

ILLUSTRATIONS.

PLATE I. *Elatostema variable* C. B. Rob. (Photograph by Eustaquio Cortes.)

II. *Elatostema sessile* Forst. Original collection, preserved in the British Museum of Natural History, London. Reduced nearly one-half. (Photograph by Percy Highley.)

III. *Astrothalamus reticulatus* (Wedd.) C. B. Rob. (Photograph by Eustaquio Cortes.)

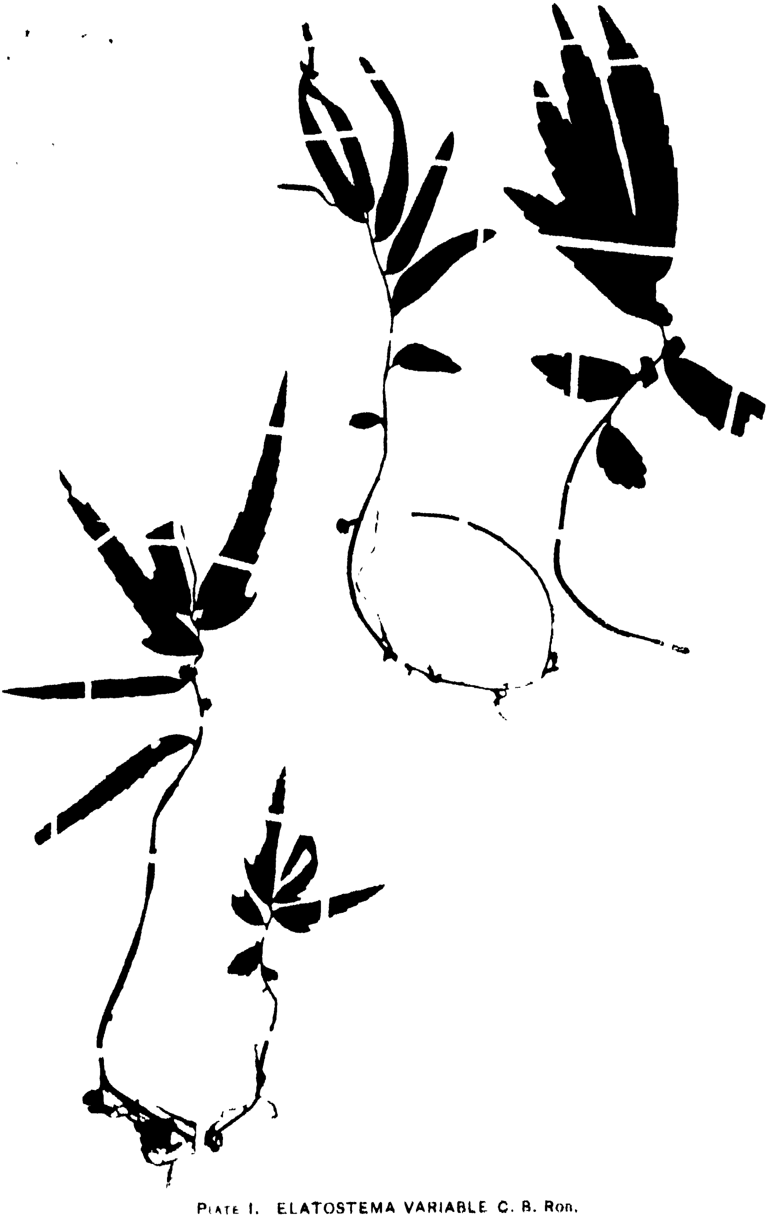

PLATE I. ELATOSTEMA VARIABLE C. B. ROB.

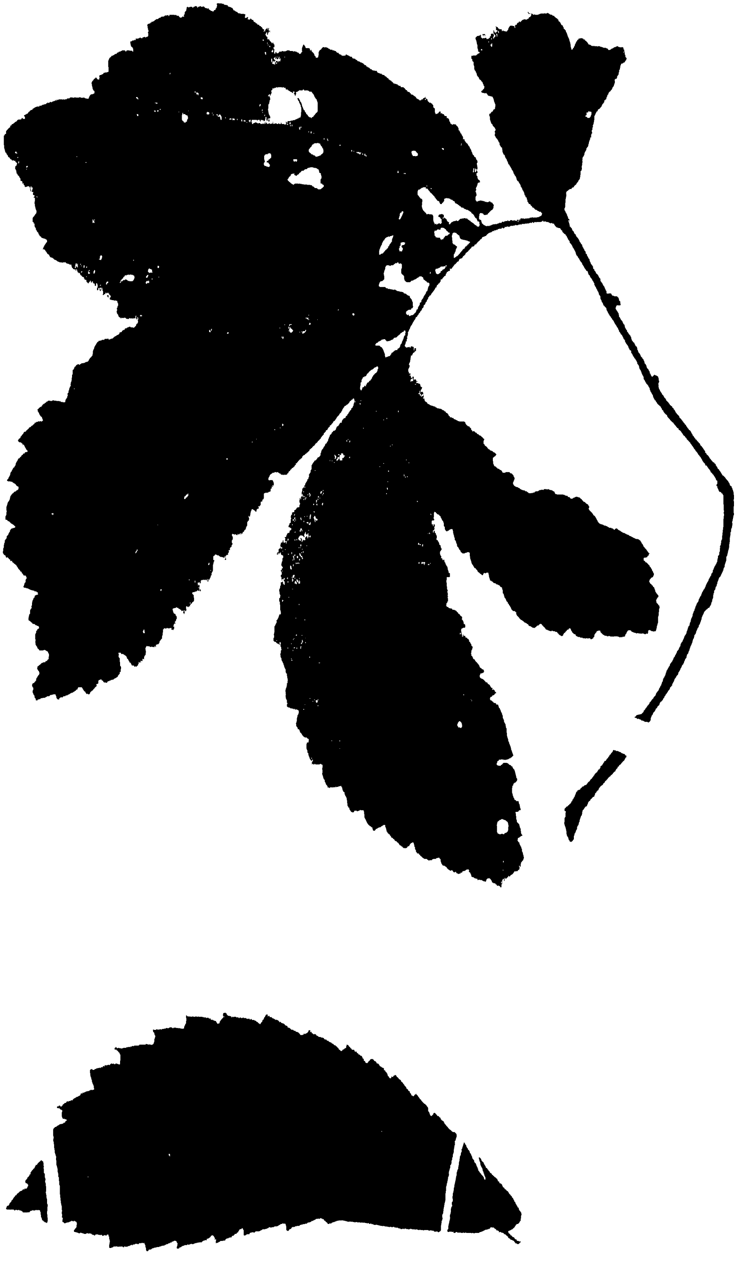

PLATE II. ELATOSTEMA SESSILE Forst.

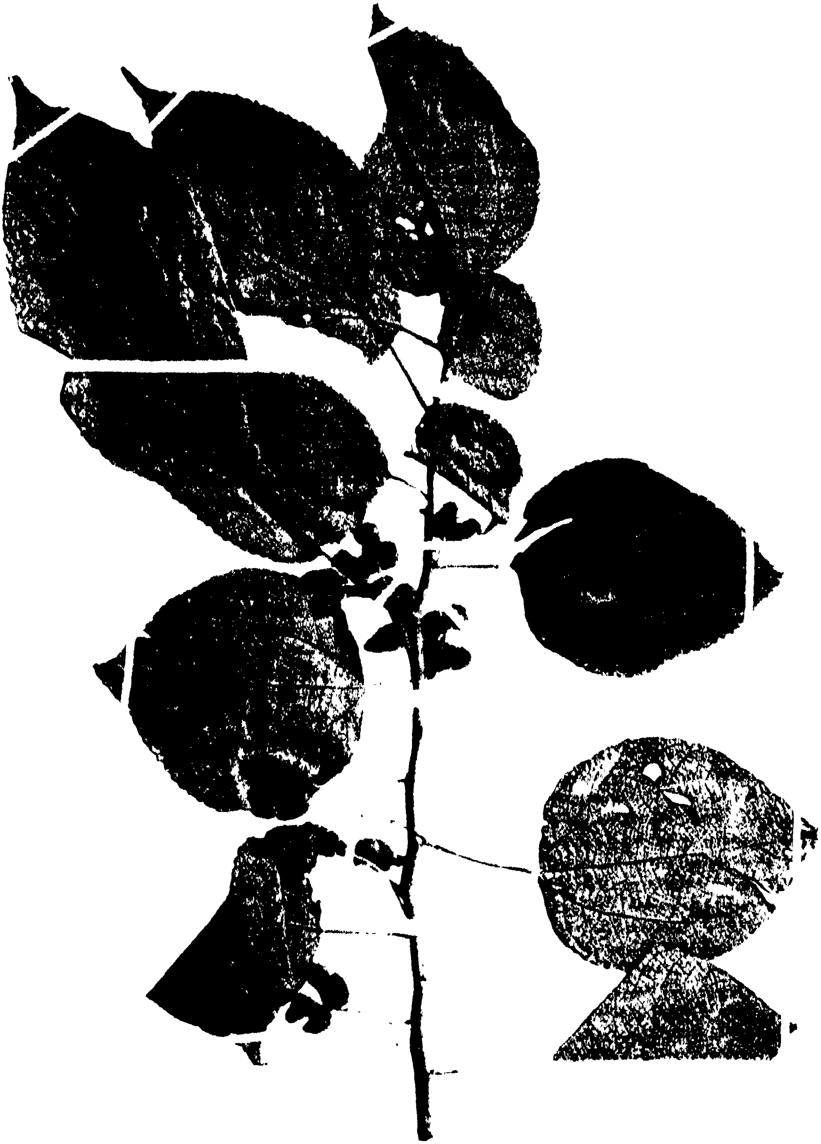

PLATE III. ASTROTHALAMUS RETICULATUS (WEDD.) C. B. ROB.

The Philippine Journal of Science, C. Botany,
Vol. VI, No. 1, March, 1911.

NOTES ON PHILIPPINE ORCHIDS WITH DESCRIPTIONS OF NEW SPECIES, III.

By Oakes Ames.

(From the Ames Botanical Laboratory, North Easton, Mass., U. S. A.)

The orchid flora of the Philippines, although rich and varied, is not distinctive. If we except the sections of one or two genera which appear to have their center of distribution in these Islands, it is very similar in type to that of adjacent regions. According to our present information nearly one-fourth of the recognized orchid genera of the world are known to inhabit the Philippines,[1] but with surprisingly few exceptions they are poorly represented in the number of species assigned to them. It is safe to say that our acquaintance with Philippine orchids is extremely limited and that further explorations are sure to add substantially to our lists of recorded species; for rarely a collection comes to hand from the Bureau of Science which does not contain either novelties, or species heretofore unknown to be natives of the Islands. Furthermore, these collections fall far short of being exhaustive in their nature. Frequently they represent only the plants that were in flower at the time the collectors were in the field. Then again, the Islands have not been botanized with equal thoroughness; Luzon, for example, being much better known than any of the others.

In my previously published lists of Philippine orchids about seventy genera and three hundred and forty-seven species have been recorded. Including the species described in "Orchidaceae" by Mr. R. A. Rolfe, and the Erias published in this Journal by Dr. R. G. Leavitt, about one hundred and sixty-five novelties have been recognized among recent collections. In addition to these there is a mass of material in the herbarium of the Bureau of Science which still remains for critical study and final identification.

I have prepared for this paper a list of the genera which have been ascribed to the Philippines, together with the number of species which have been referred to them. I have omitted genera and species which in my estimation are doubtful or which have been attributed to the

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[1] According to Pfitzer's enumeration in "Die natürlichen Pflanzenfamilien."

Philippines on unreliable information or by disputable authority. Perhaps my enumeration is ultraconservative, but I have endeavored to make it accurate, exercising rather severe censorship where adequate proof regarding a reference was not to be obtained.

In 1884, R. A. Rolfe[2] published a paper on the flora of the Philippine Islands and its probable derivation, in which he recorded for the *Orchidaceae* sixty-seven genera and four hundred and sixty species. When it is borne in mind that my list includes ten additional genera and more than one hundred species which were described after Mr. Rolfe's paper appeared, the discrepancy between his estimate and mine may be accounted for on the assumption that a more rigid exclusion was made on my part of data furnished by questionable authority. It is also possible that Mr. Rolfe possessed information which I have failed to secure. In any event it must be conceded that estimates based on printed records are never conclusive and that one author may accept what another will reject.

One source of error and uncertainty which it is extremely difficult to avoid in making provisional lists is the tendency of horticultural houses to conceal, for business reasons, the native country from which desirable orchids have been introduced. In this case species are sometimes referred to a region far distant from the real one, or are distributed among horticulturists as natives of a country from which they may not have come. Although many collectors have been in the field for the Bureau of Science during the past five years, several horticultural orchids supposedly of Philippine origin, which would have attracted attention by their size and beauty, have failed to appear in the rich collections which have been forwarded to me for identification. The explanation of this may be the one offered above. If so it indicates that horticultural records regarding distribution should be cautiously used.

Of the large Philippine genera which have been exhaustively studied, *Eria* and *Dendrochilum* occupy the foremost position. If we exclude *Dendrobium* with its fifty or more species, these two genera are the largest. *Dendrochilum* is the most interesting from a botanical viewpoint as it is the only large group which is characteristically Philippine. The section *Acoridium*, which for many years was known only through *Dendrochilum tenellum*, has grown rapidly since the botanical explorations were instituted which followed the American occupation of the Islands, until it now numbers over thirty species. Of these not one is known to be a native of any other part of the eastern Tropics and none so far as I have been able to ascertain has any near allies outside of the Philippines. When J. J. Smith monographed *Dendrochilum* in 1904 only forty-three species had been described. At present more than fifty have been identified as natives of the Philippines and of these over forty have been described since 1905. In other words the genus has, computed on the basis of Smith's monograph, been doubled since botanical explorations were begun by the Bureau of Science, and of the species discovered more than half belong to the section *Acoridium*. Furthermore, of the new species of orchids published in my contributions to our knowledge of the Philippine flora about one-third have been members of *Dendrochilum*.

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[2] Journ. Linn. Soc. Bot. 21: 283.

No similar result has been obtained in any other orchid group, the only approach to it being that experienced in the study of the section *Distichae* of the genus *Cestichis*; more species of this section being found in the Philippines than in all other regions combined.

One point worthy of remark concerning Philippine genera of *Orchidaceae* is that according to our present knowledge none are endemic. Attention was directed to this fact by Mr. Rolfe in his paper to which reference has already been made, and no exception to it has yet been noted. In connection with Mr. Rolfe's suggestions as to the probable derivation of the Philippine flora it is interesting to consider not only genera but subgenera or sections, and especially the species of *Dendrochilum* which belong to *Acoridium* and *Pseudacoridium*. If the Philippine flora is to be regarded as of comparatively recent formation by the introduction of species from neighboring territory, it is intensely interesting to study such subgenera or sections as *Acoridium* in *Dendrochilum* and *Distichae* in *Cestichis*, and to contemplate the cause of the remarkable development they seem to have experienced. Unfortunately, the orchid flora of the neighboring islands, if we except Java, has not been sufficiently investigated to warrant any definitive conclusions, but what is known makes possible a fascinating comparative study which indicates that in certain Philippine orchid genera there has been unusual development, or a minimum of extinction after introduction from regions less favorable to the species introduced. When the flora of adjacent islands is more thoroughly studied as we may find other centers of distribution for *Acoridium* and an extension of range for species now believed to be endemic. But on the basis of existing records this group is localized in the Philippines with only a few representatives in other parts of the Malayan Archipelago.

From a horticultural or economic viewpoint the orchid flora of the Philippines is of little importance. With the exception of a few species of *Aerides*, *Dendrobium*, *Eria*, *Paphiopedilum*, *Phalaenopsis* and *Vanda* there are none which may be assigned to the first rank of horticultural acquisitions.

If we distribute the Philippine genera among the five tribes admitted by Bentham in the "Genera Plantarum," which for conciseness and ease of comprehension are very useful and much less confusing than Pfitzer's cumbersome system in Engler and Prantl's "Die natürlichen Pflanzenfamilien," we have the following result:

1. *Cypripedicae*, 3 genera 10 species.
2. *Ophrydeae*, 2 genera 20 species.
3. *Neottieae*, 24 genera 42 species.
4. *Epidendreae*, 21 genera 301 species.
5. *Vandeae*, 27 genera 122 species.

THE GENERA OF PHILIPPINE ORCHIDACEAE[3] WITH THE NUMBER OF SPECIES ASSIGNED TO THEM, ALPHABETICALLY ARRANGED IN FIVE TRIBES ACCORDING TO BENTHAM AND HOOKER'S "GENERA PLANTARUM."

EPIDENDREAE.

230. *Acanthophippium*	1	
176. *Agrostophyllum*	3	
227. *Bletia?=Eulophia?*[4]		[5] 1
286. *Bulbophyllum*	16	14
219. *Calanthe*	9	4
178. *Ceratostylis*	7	2
161. *Cestichis* (*Liparis*)	16	1
147. *Chrysoglossum*	1	
150. *Coelogyne*	7	4
276. *Dendrobium*	26	25
155. *Dendrochilum*	56	2
278. *Eria*	44	3
157. *Malaxis* (*Microstylis*)	23	
145. *Nephelaphyllum*	1	
162. *Oberonia*	7	1
232. *Pachystoma*	1	
218. *Phaius*	4	1
154. *Pholidota*	2	1
280. *Phreatia*	11	
276. *Sarcopodium* (*Dendrobium*)	2	1
228. *Spathoglottis*	4	
	241	60

VANDEAE.

296. *Acriopsis*	1	1
404. *Aerides*	4	3
392. *Angraecum*	1	
383. *Cleisostoma*	4	7
302. *Cymbidium*	2	1
299. *Dipodium*	1	
381. *Doritis*	1	
235. *Eulophia*	6	1

VANDEAE—Continued.

233. *Geodorum*	1	
297. *Grammatophyllum*	2	3
376. *Luisia*	2	1
380. *Phalaenopsis*	4	10
226. *Plocoglottis*	3	
172. *Podochilus*	19	
169. *Polystachya*	1	
373. *Renanthera*	1	1
408. *Rhynchostylis*	2	
387. *Saccolabium*	3	3
382. *Sarcanthus*	2	2
406. *Sarcochilus*		5
378. *Stauropsis*	1	1
402. *Taeniophyllum*	3	
295. *Thelasis*	5	
406. *Thrixspermum*	2	
410. *Trichoglottis*	4	3
391. *Vanda*	4	
375. *Vandopsis*	1	
	80	42

OPHRYDEAE.

32. *Habenaria*	15	4
14. *Herminium*	1	
	16	4

NEOTTIEAE.

111. *Adenostylis* (*Zeuxine*)	3	1
94. *Aphyllorchis*	2	
112. *Cheirostylis*	2	
140. *Chloidia* (*Corymbis*)	1	
73. *Corybas* (*Corysanthes*)	1	
80. *Cryptostylis*	1	

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[3] The numbers before the generic names indicate the position or the approximate position of each genus in Pfitzer's treatment of the *Orchidaceae* in Engler & Prantl's "Die natürlichen Pflanzenfamilien."

[4] *Bletia stricta* Presl. Placed by Lindley in "The Genera and Species of Orchidaceous Plants" among *Species valde dubiae*, under *Eulophia*.

[5] The figures in the second column indicate species of which I have seen no Philippine material.

	NEOTTIEAE—Continued.		
106.	*Cystorchis*	2	
95.	*Didymoplexis*	1	
113.	*Epipactis* (*Goodyera*)	4	
107.	*Erythrodes*	1	
93.	*Epipogum*	1	
86.	*Galeola*	1	
121.	*Haemaria*	1	
116.	*Hetaeria*	1	
122.	*Hylophila*	1	
55.	*Microtis*	1	
118.	*Myrmechis*	2	
74.	*Pogonia*	3	
99.	*Spiranthes*	1	
81.	*Stereosandra*	1	
51.	*Thelymitra*	1	
·139.	*Tropidia*	2	3
89.	*Vanilla*	1	2
105.	*Vrydagzynea*	1	
		36	6
	CYPRIPEDIEAE.		
2.	*Apostasia*	1	
1.	*Neuwiedia*	1	1
5.	*Paphiopedilum*	4	3
		6	4
	Total number of genera		77
	Total number of species		[*]405

LIST OF SPECIES.

The following list of species includes descriptions of novelties, additions to my previous records, and notes on species which supplement previously published data. The genera are arranged in accordance with the sequence adopted by Pfitzer in Engler and Prantl's "Die natürlichen Pflanzenfamilien." Two genera are added to the number already known to be indigenous, namely *Pachystoma* and *Dipodium*, twenty-two new species are described, and fifteen additions made to the number of species in my lists of Philippine orchids.

5. PAPHIOPEDILUM Pfitzer.

Paphiopedilum Haynaldianum (Reichb. f.) Stein Orchideenb. 470.

Specimens of this well-known horticultural orchid have been received from Mr. W. S. Lyon. It was originally collected by Wallis near Manila in 1874.

LUZON, Tarlac Province, *Lyon 49*, not much above sea level.

Paphiopedilum ciliolare (Reichb. f.) Stein Orchideenb. 462, *f. 145*.

This species which has been reported from Mindanao was collected by Mr. W. S. Lyon on Dinagat Island in February, 1909 (No. 142).

I have as yet found no specimens among the collections of the Bureau of Science of *P. philippinensis*, *P. Lowii*, and *P. Rothschildianum*, all of which have been ascribed to the Philippine Islands.

106. CYSTORCHIS Bl.

Cystorchis javanica Blume Fl. Jav. Orch. (1858) 87.

Cystorchis variegata var. *purpurea* Ridl. in Journ. Linn. Soc. Bot. **32**: 399.

What I take to be a representative of *C. javanica* proper comes from the Island of Polillo. According to notes made by the collector the leaves are purplish, a characteristic of the species. *C. variegata*, which is a variety of *C. javanica*, has green leaves. Only a single specimen was found.

Plant 1.5 dm tall from a creeping rhizome, leafy. *Leaves* petiolate, the lamina ovate-lanceolate about 3 cm long. *Peduncle* puberulous, slender, bracteate. *Flowers* 5 to 6 mm long. *Lateral sepals* oblong, obtuse, 1-nerved, with the upper sepal forming a hood over the gynaecium. *Labellum* saccate at the base, with two globose appendages, one on each side, base of the sac acute, protruding between the lateral sepals; lamina elongated, entire, obtuse.

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[*] The species to which reference is made in this paper are included in this enumeration.

POLILLO, *Bur. Sci. 9282 C. B. Robinson*, August 19, 1909, terrestrial, 100 m above the sea.

150. COELOGYNE Lindl.

Coelogyne integerrima Ames in Philip. Journ. Sci. 4 (1909) Bot. 665.

Another collection of this species has come to hand from Pauai where it was found at an altitude of 2,100 m. The flowers are described by the collector as pale-green. In dried specimens the labellum appears to have been brownish at the base and near the middle. The graceful racemes are nearly erect or drooping, with about eight large flowers. From its appearance when dried this species ought to be worthy of cultivation for horticultural purposes.

LUZON, Benguet Subprovince, Pauai, *Bur. Sci. 8454, 8519 R. C. McGregor*, May, 1909, at an altitude of about 2,100 m.

Coelogyne Merrillii sp. nov.

Pseudobulbi fasciculati, pyriformes vel ovoideo-oblongi, rugosi, *diphylli*, circiter 4 cm longi, plus minus 2.4 cm in diametro. *Folia* oblongi-lanceolata, acuminata, acuta, nervosa, breviter petiolata, 9.5–15 cm longa, 1.6–3.6 cm lata, prominente 3–5-nervia, subcoriacea. *Pedunculi* terminales, a pseudobulbo immaturo producti, erecti, 8.5–15 cm longi, ancipites, bialati. *Racemus* flexuosus, circa 2–4-florus. *Bracteae* deciduae ? circa 3 cm longae, lanceolatae, acutae. *Sepala lateralia* oblonga, acuta, 3.4 cm longa, 1 cm lata. *Sepalum dorsale* lanceolatum, 3.7 cm longum, 11 mm latum. *Petala* linearia, 3.5 cm longa, 2 mm lata, acuta, prominente 1-nervia. *Labellum* ovatum, 3-lobatum, 3.7 cm longum, 2 cm latum; *lobus medius* lateralibus major, oblongus cum apiculo, 1.5 cm longus, 1 cm latus; *lobi laterales* obtusi, 3 mm longi, carinae 5, flexuosae, margine lacerae, usque ad basim lobi medii extensae. *Columna* clavata, 3 cm longa.

LUZON, Benguet Subprovince, Pauai, *Merrill 6620*, May, 1909, on boulders in upper pine region, about 1,800 m altitude, flowers somewhat straw-colored, very fragrant, odor of *Nymphaea*.

This species belongs in Pfitzer's ninth section, *Cristatæ*, and appears to be distinct from all known species of the genus. The carinae of the lip, five in number, are various in length, the middle one hardly extends to the base of the middle lobe while the outer ones are abbreviated, about 4 mm long, and situated near the lateral lobes.

Coelogyne marmorata Reichb. f. is, from the description, a closely allied species. I have seen no material. *C. Loheri* Rolfe is another near ally, but belongs to quite another section of the genus. My conception of *C. Loheri* is based on a specimen in the U. S. National Herbarium which is a duplicate of the type number (*Loher 549*).

155. DENDROCHILUM Bl.

Dendrochilum (§ Platyclinis) cagayanense sp. nov.

Aff. D. Cobbiano. *Pseudobulbi* 8 cm longi, 1.5 cm in crassitudine, cylindracei, vaginis tubularibus, arcte appressis, acutis vestiti. *Folia* magna, petiolata, 3 dm longa, 6 cm lata, coriacea, elliptico-lanceolata, subacuta; petiolus 1.5 dm longus. *Pedunculus* multo folium excedens, 4.5 dm longus. *Racemus* circiter 2.5 dm longus. *Bracteae inflorescentiae* glumaceae, acutae, pedicellum cum ovario excedentes ad basim flores amplectentes, 1 cm longae, 7 mm latae. *Sepala lateralia* lineari-lanceolata, acuta, 11 mm longa. *Sepalum dorsale* simile. *Petala* lineari-lanceolata, 3-nervia, 9 mm longa, 2 mm lata. *Labellum* 3-lobatum; *lobi laterales* minuti, triangulares, 0.75 mm longi; *lobus medius* oblongus, ad apicem rotundatus, 3.5 mm longus, 2 mm latus. *Columna* apice crenulato; alae laterales a basi ortae.

LUZON, Province of Cagayan, *For. Bur. 16772 H. M. Curran*, March 4, 1909.

Dendrochilum cagayanense is a near ally of *D. Cobbianum*. It is a more robust species with narrow sepals and petals and a very different labellum. As in *D. Cobbianum* the lateral lobes of the labellum are inconspicuous and much reduced, but are somewhat setaceous. The stelidia of the column are linear-triangular and basal. Their tips reach to the base of the obscurely crenulate or denticulate terminal wing.

Dendrochilum (§ Acoridium) confusum sp. nov.

Sepala lateralia 3-nervia, 3 mm longa, 1.75 mm lata. *Sepalum intermedium* lateralibus simile. *Petala* oblanceolata, obtusa, 3-nervia, 3 mm longa, 1.75 mm lata. *Labellum* spathulatum vel cuneato-obovatum, 2.75 mm longum, 2 mm latum prope apicem.

This is the small flowered plant which I described in "Orchidaceae" II as *D. bicallosum* var. *minor*. More material has come to hand which necessitates a revision of my former views. Aside from the constant difference in the form of the labellum and the size of the flowers there are other points of dissimilarity which I think can not be passed over as merely varietal. These, however, are difficult to describe although apparent when flowers of the two species are compared side by side. The flowers of *D. bicallosum* are more stellate in aspect, when flattened out, than those of *D. confusum*, and their general shape gives the impression that the sepals, petals and labellum are longer in proportion to the width than the corresponding parts of *D. confusum*. The racemes of *D. confusum* are much more densely flowered and shorter than those of *D. bicallosum*.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci. 5640 H. M. Curran*, flowers somewhat salmon-colored, odorless.

Dendrochilum bicallosum has also been found on Mount Maquiling, where it was collected in 1907 by *H. M. Curran & M. L. Merritt, For. Bur. 7797*.

Dendrochilum (§ Platyclinis) cymbiforme sp. nov.

Pseudobulbi pyriformes, in sicco rugosi, 2 cm longi, 6 cm in crassitudine prope basim, *vaginis* tubularibus, arcte appressis, acutis, vestiti. *Folia* lineari-lanceolata, acuta, coriacea, nitida, 1.5–1.6 dm longa, 1.5 cm lata, petiolata; *petioli* 4 cm longi. *Bracteae inflorescentiae* 4 mm longae, cymbiformes. *Pedunculus* multo folium excedens, gracilis, flexuosus, 3 dm longus. *Racemus* 1.5 dm longus. *Sepala lateralia* oblonga, acuta, subfalcata, 4 mm longa, 1.5 mm lata. *Sepalum dorsale* oblongum, acutum, 3 mm longum. *Petala* oblonga, acuta, uninervia, ad basim angustata, 3 mm longa, 1 mm lata. *Labellum* cymbiforme, 4 mm longum, rotundatum vel ellipticum, apiculatum, integerrimum. *Columna* rigida, 3 mm longa; alae laterales in dentes perbreves triangulares reductae, quorum unus utroque ad basim columnae stat.

LUZON, Abra Subprovince, Mount Bawagan, *Bur. Sci. 7133, 7135 Maximo Ramos*, February 9, 1909, flowers yellow, altitude about 550 m.

From all other Philippine species *Dendrochilum cymbiforme* is clearly separable by means of its cymbiform, entire labellum and triangular, reduced, basally situated stelidia. In dried specimens the leaves are glossy above and leathery in texture. *C. cymbiforme* appears to be very distinct from all known species of the genus.

Dendrochilum (§ Acoridium) Macgregorii sp. nov.

Pseudobulbi pyriformes, in sicco rugosi, 8–15 mm longi, vaginis tubularibus, arcte appressis, acutis, vestiti. *Folia* linearia, rigida, acuta, submembranacea, 6.5–10.4 cm longa, 2 mm lata, petiolata. *Bracteae inflorescentiae* 2 mm longae, 2 mm latae, cymbiformes. *Pedunculus* filiformis, folio longitudine fere aequalis, vel brevior. *Racemus* 4.5 cm longus, distichus. *Sepala lateralia* ovato-lanceolata, acuta, 2–2.5 mm longa, 1.25 mm lata. *Sepalum* dorsale oblongum, obtusum, 2 mm longum. *Petala* obovata, 3-nervia, 2 mm longa, obtusa vel subacuta. *Labellum* cuneato-ovatum, apiculatum, integerrimum, ad basim subcordatum, 1 mm longum, ad basim labelli prope columnam callus incrassatus. *Columna* ut in D. pumilo.

LUZON, Benguet Subprovince, Mount Pulog, *Bur. Sci. 8849 R. C. McGregor*, July 4, 1909.

Dendrochilum Macgregorii is a slender species which resembles *D. exile* in habit, although it is more closely related to *D. Whitfordii* than to any other known species of the genus. The labellum resembles that of *D. Whitfordii* very closely. The narrow grass-like leaves which usually exceed the inflorescence, the shorter, denser racemes and the smaller flowers are characters which clearly distinguish *D. Whitfordii*. The flowers in dried specimens are deep-madder.

157. MALAXIS Soland. ex Sw.

Malaxis balabacensis sp. nov.

Planta 1–4 dm alta, foliosa, floribus flavis in racemo gracili, spicato, ±1.5 dm longo. Folia 6, ovato-lanceolata, acuminata, acuta, nervosa, 5–12 cm longa, usque ad 5 cm lata, in sicco chartacea glabra. *Pedunculus* angulatus, 1–2.5 dm longus, foliis longior. *Bracteae* lineari-lanceolatae, acuminatae, acutae, 4–7 mm longae, scariosae, dependentes.

Racemus sublaxiflorus, usque ad 13 cm longus. *Sepala lateralia* ovata, 3–3.5 mm longa, prope basim 3 mm lata, 3-nervia. *Sepalum dorsale* ovatum, acutum, 3–4 mm longum, 3-nervium. *Petala* rhombico-lanceolata, 4 mm longa, 2 mm lata, 1-nervia. *Labellum* integerrimum, subrotundatum, a basi labelli ad apicem 2 mm longum, prope apicem callus incrassatus; *auriculae* oblongae, obtusae, 1 mm longae. *Columna* brevis, stelidiis obtusis truncatis; ad basim columnae a tergo dens, vel papilla.

BALABAC, *Merrill 5374*, October 16, 1906 (type), in forests, terrestrial, altitude about 20 m. SIBUTU (Sulu Archipelago), *Merrill 5296*, October 13, 1906, in dry thickets near the seashore.

This species is clearly distinguished from all others from the Philippines, except *M. Ramosii*, of which I have any knowledge, through its rhombic-lanceolate petals. At the base of the column on its outer surface there is a conspicuous decurved tooth or papilla. The labellum is rotundate, deeply cordate-cleft at the base, and near the tip bears a curious callus which in dried specimens is blackish and which at its posterior end terminates in a minute fovea.

Malaxis bataanensis sp. nov.

Caulis brevis, circiter 3 cm longus. *Folia* 2 (vel 3 ?), chartacea, lanceolata superne, inferne late ovata, acuminata, acuta, 6–7 cm longa, 1.5–3.5 cm lata, in petiolum latum vaginantem transiens. *Pedunculus* elongatus, inferne nudus, bialatus, gracilis, 2–2.8 dm longus, 1–1.5 mm in crassitudine. *Racemus* spiciformis, valde elongatus, usque ad 2 dm longus. *Flores* multi, color luteus, qualis est mali aurantii. *Bracteae inflorescentiae* valde dependentes, triangulares, acutae, setaceae, ±4 mm longae. Pedicelli cum ovario 4 mm longi. *Sepala lateralia* orbicularia, 3-nervia, 2.5 mm longa, 2 mm lata. *Sepalum posticum* lateralibus majus, ellipticum, subacutum, 3.75 mm longum, 2 mm latum. *Petala* lanceolata, 1-nervia, subacuta, basi attenuata, 3 mm longa, 1.5 mm lata. *Labellum* integerrimum, rotundatum, cordatum, a basi labelli ad apicem 1.5 mm longum; *auriculae* minutae, obtusae; in disco callus elongatus. *Columna* crassiuscula, circiter 1.5 mm longa. *Capsula* ellipsoidalis 9 mm longa.

LUZON, Province of Bataan, Mount Mariveles, *Bur. Sci. 1674 F. W. Foxworthy*, October 17, 1906, terrestrial, 800 m above sea level. (Type in Hb. Bur. Sci.; duplicate in Hb. Ames.)

The flowers of this species are similar to those of *M. balabacensis* and *M. Ramosii*. In aspect, however, the plant is quite distinctive. The elongated peduncles, which are wand-like and conspicuously tall, are characteristic. Three-fourths of the peduncle, at least, is floriferous. The specimens examined bear two large leaves, the upper one lanceolate, the lower one ovate, and near the base a foliaceous bract. The flowers are caducous, consequently the peduncles, in mature specimens, seem to have the flowers crowded in short racemes.

Malaxis benguetensis sp. nov.

Herba 1–2.2 dm alta. *Caulis* crassus vix bulbosus, vaginis tectus, usque ad 4 cm longus. *Folia* 3 vel 4, vix petiolata, ovato-lanceolata, acuminata, acuta, 3–9 cm longa, 1.2–3.7 cm lata (rarissime 3 cm longa), nervosa, chartacea. *Pedunculus* erectus, 8–15 cm longus, foliis longior. *Racemus* cylindricus, sublaxiflorus, 3–7.5 cm longus, in sicco 1.5 cm in diametro. *Bracteae* lineari-lanceolatae, acuminatae, circiter 6 mm longae, dependentes. *Flores* numerosi, fusco-virides vel purpurascentes. *Sepala lateralia* elliptica, circiter 2 mm longa, 1.5 mm lata, 1-nervia. *Sepalum dorsale* ovatum, 2.5 mm longum, 1–1.25 mm latum, obtusum, 1-nervium. *Petala* linearia, obtusa, 1-nervia, circiter 2.5 mm longa, 0.75 mm lata. *Labellum* obscure trilobatum, concavum, late cordato-hastatum, 2.5 mm longum, 3 mm latum; *lobis lateralibus* vix distinctis, rotundatis; *lobus medius* rotundatus, obtusus, callo crescentiforme in margine. *Columna* brevis, crassiuscula.

LUZON, Benguet Subprovince, Pauai, *Bur. Sci. 8362 McGregor*, June, 1909, altitude 2,100 m.

The material at hand exhibits a wide range of variation in measurements. The labellum is round heart-shaped or broadly and bluntly hastate. From the base a distinct vein emerges on each side and extends round the circular depression of the lip and is thickened along the innner margin of the middle lobe to form a crescent-shaped membranaceous callus.

Malaxis Curranii sp. nov.

Aff. M. latifoliae, at triplo minor. *Herba* usque ad 2 dm alta, gracilis, folia 3. *Caulis* ±3 cm longus vix incrassatus. *Folia* lanceolata, acuminata, acuta, breviter petiolata, 5–10 cm longa, circiter 1.5 cm lata, chartacea, nervosa. *Pedunculus* gracilis, angulatus, foliis longior, 9–15 cm longus. *Racemus* compactus, cylindricus, 1–2.5 cm longus, 5 mm in diametro; flores plures, parvi, luteo-virides. *Bracteae* lineari-lanceolatae, setaceae. *Sepala lateralia* elliptico-oblonga, obtusa, 3-nervia, 3 mm longa, 1.5 mm lata. *Sepalum dorsale* simile. *Petala* lineari-oblanceolata, acuta, 1-nervia, 3 mm longa, 0.5 mm lata. *Labellum* cymbiforme, 2 mm longum, auriculis parvis, apice trilobo, *lobis lateralibus* obtusis, *medio* subacuto longiore, lanceolato; *lobi laterales* minuti; lobus medius 1 mm longus. *Columna* brevis.

LUZON, Benguet Subprovince, *For. Bur. 5105 Curran*, August 16, 1906, open pine forest.

The differences between *M. Curranii* and typical *M. latifolia* are chiefly habital. The habit of the species here proposed is quite distinctive. The floral details, however, are not sufficiently unlike *M. latifolia* to be easily emphasized in a description. The shorter, more slender peduncle and raceme, and the acute middle lobe of the labellum must be relied on in differentiating the Philippine material from typical *M. latifolia*.

Malaxis latifolia Smith in Rees's Cycl. **22**, No. 3.
Microstylis congesta Reichb. f. in Walp. Ann. **6**: 206.
Malaxis plicata Roxb. Fl. Ind. **3**: 456.
Dienia congesta Lindl. in Wall. Cat. no. 1936.

In the Herbarium of the Bureau of Science there are two specimens which in my opinion belong to this species. One of these is typical, the other has purplish flowers and probably represents the variety *fusca*.

Luzon, Rizal Province, *Bur. Sci. 4667 Maximo Ramos*, August, 1907.

Var. **fusca** cf. Ridley in Journ. Linn. Soc. Bot. **24**: 335.

Luzon, Benguet Subprovince, *Bur. Sci. 3492 Major E. A. Mearns*, July, 1907.

M. latifolia is a variable species which is found in Java, Sumatra, Borneo, Siam, China, New Guinea and Australia. (Cf. *fig. CLXXXV* in the third volume of plates which accompany J. J. Smith's "De Orchideen von Java").

Malaxis Macgregorii sp. nov.

Planta foliosa. *Caulis* vix incrassatus. *Folia* 6–9, lanceolata, acuminata, acuta, multinervia, 5–11 cm longa, 3 cm lata. *Petiolus* latus, vaginans, 3 cm longus. *Inflorescentia* cum pedunculo 1.5 dm longa, foliis longior. *Flores* in racemo laxo languente, circiter 1 cm distantes. *Bracteae* lineari-lanceolatae dependentes. *Sepala lateralia* elliptica, obtusa, 3 mm longa. *Sepalum dorsale* simile. *Petala* lineari-oblonga, circiter 2 mm longa. *Labellum* 4 mm longum, auriculatum; lobus medius subquadratus, ad apicem bifidus; auriculae magnae; in sinu utroque prope basim lobi medii dentes 2 stant.

Polillo, *Bur. Sci. 10440 R. C. McGregor*, October 19, 1909, terrestrial.

Malaxis Macgregorii is nearly allied to *M. dentata* Ames and to *Microstylis micrantha* Hook. f. (cf. "Icones Plantarum" *pl. 1834*). The flowers of *Malaxis dentata* are smaller, however, and the different middle lobe of the labellum is quite distinctive. According to field notes the flowers of *M. Macgregorii* are rose-carmine.

Malaxis Ramosii sp. nov.

Herba 1–2 dm alta in anthesi. *Caulis* brevis, circiter 3 cm longus. *Folia* 3, lanceolata, acuminata, acuta, 4–10 cm longa, 1.5–3 cm lata, nervosa. *Pedunculus* 7–16 cm longus, foliis longior. *Bracteae* lineari-lanceolatae acuminatae, acutae, 3 mm longae, dependentes. *Racemus* usque ad 9 cm longus. *Flores* 3–5 mm distantes, circa 9 mm in diametro. *Pedicelli* circiter 6 mm longi. *Sepala lateralia* ovata, 3-nervia, 4 mm longa, 3 mm lata. *Sepalum dorsale* ovato-lanceolatum, 3-nervium, 5 mm longum, 3 mm latum. *Petala* rhombico-lanceolata, 4.75 mm longa, 3 mm lata, 3-nervium. *Labellum* integerrimum, rotundatum, a basi labelli ad apicem 2 mm longum; *auriculae* oblongae, obtusae, 1 mm longae. *Columna* brevis, ad basim columnae dens, vel papilla a tergo.

Luzon, Rizal Province, Bosoboso, *Bur. Sci. 4567 Maximo Ramos*, August 14, 1907.

M. Ramosii is closely allied to *M. balabacensis* from which it differs in its smaller size and larger flowers. The petals of *M. balabacensis* are narrower in relation to their length and not so rhombic as those of *M. Ramosii*; then again the peduncles of *M. balabacensis* are much longer in relation to the leaves.

Malaxis rizalensis sp. nov.

Aff. M. purpureae. *Caulis* brevis, 3–4 cm longus, vix incrassatus. *Folia* 3–5, lanceolata vel ovato-lanceolata, acuminata, acuta, petiolata; *lamina* 6–13 cm longa, 2.5–4.5 cm lata. *Petiolus* vaginans, 2.5–3.5 cm longus. Tota planta usque ad 2.2 dm alta. *Pedunculus* 9–17 cm longus, foliis longior. *Racemus* circiter 9 cm longus, laxiflorus, *flores* purpurei. *Bracteae* lineari-lanceolatae, 5 mm longae, dependentes. *Pedicelli* usque ad 7 mm longi. *Sepala lateralia* elliptica valde obtusa, 4-nervia, 3.5 mm longa, 1.5 mm lata. *Sepalum dorsale* oblongum, obtusum, 4.5 mm longum, circiter 1.5 mm latum. *Petala* lineari-oblonga, obtusa, 3-nervia, 4 mm longa, 1 mm lata. *Labellum* magnum, ovato-cordatum, obscure 3-lobatum; *lobus medius* bifidus, 3 mm longus, 3 mm latus; *lobi laterales* obtusi, minuti, producti in auriculas magnas, obtusas, inter quas columna prominet. *Auriculae* oblongae 2 mm longae, 1.5 mm latae in sicco nervosae. *Columna* crassiuscula.

LUZON, Rizal Province, Bosoboso, *Bur. Sci. 4561 Maximo Ramos*, August, 1907. (*Type* in Hb. Bur. Sci., no duplicate).

M. rizalensis is a very near ally of *M. purpurea* and when studied with the aid of more material than I possess may prove to be conspecific with it. The stems are short and the leaves are not conspicuously congested. At least my material is clearly differentiated from Zollinger's no. 2536 (Hb. British Museum of Natural History) cited by Ridley under *Microstylis purpurea* in the "Revision of the Genera Microstylis and Malaxis," and by J. J. Smith in "Die Orchideen von Java." The labellum of *M. rizalensis* resembles in general outline that of *M. Hutchinsoniana* (cf. Ames, Orchidaceae 2: 128) but is distinguishable from it by its bifid apex, the divisions of which are oblong, obtuse, 1.5 mm long. *M. Wallichii* is a near ally of our species.

Malaxis uncata sp. nov.

M. sagittatae (J. J. Sm.) affinis. *Caulis* brevis vix incrassatus, usque ad 2 cm longus. *Folia* breviter petiolata, 3, quorum unum parvulum est. *Lamina* lanceolata, breviter acuminata, acuta, glabra, 5-nervia. *Folium* infimum usque ad 2 cm longum. *Folium* superum 8 cm longum, 2.5–3 cm latum. *Pedunculus* elongatus, gracilis, 11–18 cm longus. *Bracteae* dependentes, lineari-lanceolatae, setaceae, valde acutae, plus minus 5 mm longae. *Pedicelli* elongati, usque ad 1 cm longi. *Flores* flavidi. *Sepala lateralia* elliptica, ad apicem rotundata, 3 mm longa, 2 mm lata. *Sepalum posticum* ovato-lanceolatum, obtusum, 3-nervium, 3.5 mm longum, 2.5 mm latum. *Petala* linearia, 1-nervia, 4 mm longa, 0.5 mm lata. *Labellum* integerrimum, late sagittatum; auriculis obtusis 1.5 mm longis. *Discus* usque ad 2 mm longus. *Callus* bilobus in disco medio. *Columna* crassiuscula, 1 mm longa, a tergo, prope basim, dens uncinatus. *Capsula* ellipsoidalis, 6–8 mm longa.

LUZON, Laguna-Tayabas Provinces, *For. Bur. 9552 H. M. Curran*, March, 1908.

M. uncata is closely allied to **Malaxis sagittata** (J. J. Sm.) (*Microstylis sagittata* J. J. Sm. Ic. Bog. 2: *t. CVII, C.*, Die Orchideen von Java 252), from which it differs in its narrower leaves, yellowish-flowers, broader upper sepal and more broadly sagittate lip.

The type collection consists of two plants, preserved in the Herbarium of the Bureau of Science. Unfortunately both plants are in fruit so that my description is based on terminal flowers. The flowers in dried specimens are yellowish.

161. CESTICHIS Pfitzer.

Cestichis Lyonii sp. nov.

Radices multae, fibratae. *Pseudobulbi* fasciculati, 2 cm longi, complanati, in sicco usque ad 1.5 cm in crassitudine, rugosi. *Folia* bina, oblongi-lanceolata, acuta, utrinque glabra, 6.5–8.5 cm longa, 1–1.5 cm lata, coriacea, in petiolos desinentia. *Petiolus* brevis, 5 mm longus. *Pedunculus* terminalis, bialatus, foliis longior, usque ad 23 cm longus, erectus. *Bracteae* lineari-lanceolatae, setaceae, elongatae, 1 cm longae. *Racemus* longissimus, densus, usque ad 12 cm longus. *Bracteae inflorescentiae* lanceolatae, acutae, 2–4 mm longae, pedicellum et ovarium excedentes. *Flores* flavidi. *Sepala lateralia* oblongi-lanceolata, acuta, valde uninervia, 4.5 mm longa, 2 mm lata. *Sepalum intermedium* simile. *Petala* linearia, uninervia, 4 mm longa. *Labellum* orbiculare subito acuminatum, 5-nervium, 4 mm longum, circiter 3 mm latum. *Columna* exalata, crassiuscula, 2 mm longa.

LUZON, Benguet Subprovince, Baguio, *155 W. S. Lyon* (type in Hb. Ames). MINDORO, Mount Inauan. *For. Bur. 9959 M. L. Merritt*, January 22, 1908, 1,300 m altitude (single specimen in Hb. Bureau of Science).

The labellum is orbicular and at the apex abruptly contracted into an obtuse tip. The pseudobulbs in dried specimens have the appearance of having been strongly compressed or flattened when fresh.

162. OBERONIA Lindl.

Oberonia cylindrica Lindl. Bot. Reg. 1840, Misc. 20, Fol. Orch. Oberonia 2; Ames Orchidaceae 1: 77.

This species appears to be very common in northern Luzon. The material from which Lindley obtained his original and very brief description was imported from Manila by Messrs. Loddiges. From Lindley's description, in the "Botanical Register," it is quite impossible to identify with any degree of surety plants which may prove conspecific with *O. cylindrica*. Furthermore, his remarks in "Folia Orchidacea" are inconclusive. In neither work does he refer to foliage, although in "Folia Orchidacea" he places *O. cylindrica* in the same section with *O. iridifolia*, among the acaulescent species which have radical leaves. In order to obtain light on the subject I sent a specimen, representative of material which I had identified with Lindley's species, to Kew, where it was carefully compared with the type. This comparison verified my conclusions and also revealed the fact that Lindley's specimen is destitute of foliage, consisting of the inflorescence only. For a description, supplementary to Lindley's, reference should be made to my list of Philippine orchids published in the first volume of "Orchidaceae."

LUZON, Benguet Subprovince, Mount Pulog, *Elmer D. Merrill 6573*, May, 1909, *Bur. Sci. 8823 R. C. McGregor*, July, 1909, *E. B. Copeland s. n.*, 2,300 m altitude, in mossy forest, May 12, 1909; Mount Tonglon, *Bur. Sci. 5476 Maximo Ramos*, December, 1908; Baguio, *R. S. Williams 1082*, 1904: Bontoc Subprovince, *Father M. Vanoverbergh, 407*, 1910 (specimen in fruit).

172. PODOCHILUS Bl.

This is an intricate genus with which it is almost impossible to do satisfactory work owing to the fragmentary condition of the specimens usually found in herbaria. One must rely to a large extent on descriptions and these are too frequently inadequate because of the similarity between many of the species.

Podochilus fenixii sp. nov.

Caules plus minus 3 dm alti, simplices, graciles. *Folia* oblongi-lanceolata inferne, superne linearia, acuminata, plus minus 5 cm longa, 3–11 mm lata; utrinque glabra, usque ad 4 mm in crassitudine in sicco, nervo intermedio in apiculum minutum producto. *Inflorescentia* terminalis et lateralis brevis. *Racemus* pauciflorus, foliis multo brevior. *Pedunculus* cum racemo usque ad 1.5 cm longus. *Bracteae* cymbiformes ovatae, acuminatae, acutae, 4 mm longae, inferne imbricatae. *Flores* albi. *Sepala lateralia* ovato-lanceolata, acuminata, acuta, 3-nervia, 4 mm longa, ad basim 2.5 mm lata. *Sepalum dorsale* concavum, ovatum, obtusum, plus minus 3 mm longum. *Petala* oblonga vel oblongi-lanceolata, acuta, 3-nervia, 2.75 mm longa. *Labellum* oblongum, obtusum, 4.75 mm longum, ad basim saccatum; prope apicem labelli tuberculum minutum, post quod callus multo major; prope basim labelli callus cucullatus, V-formis.

BATANES ISLANDS, Batan, Santo Domingo de Basco, *Bur. Sci. 3794 Eugenio Fénix*, June 8, 1907.

In habit, if we except the inflorescence, this species resembles very closely *P. dendrobioides* Schlechter. The labellum is distinctive as it bears three calli; one at the apex, a minute protuberance; one near the middle, a transversely situated keel or cushion, and one near the base, this last being V-shaped, cucullate at its closed end. In several of the specimens examined the racemes are numerous. They arise from the axils of the leaves beginning at about the middle of the stem, and are produced with few interruptions from there to the summit.

Podochilus (§ Appendicula) fruticosus sp. nov.

Caulis ramosus, 3 dm longus. *Folia* oblonga, 1–2 cm longa, 2–4 mm lata, ad apicem inaequaliter bilobata. *Flores* terminales et laterales, in capitulis bracteatis. *Bracteae* acutae, 3 mm longae. *Sepala lateralia* triangularia, 3-nervia, acuta, 2.5 mm longa, 2 mm lata ad basim. Petala lineari-oblonga, obtusa, 1-nervia, 1.75 mm longa. *Labellum* 3 mm longum, breviter unguiculatum; lamina obovata vel suborbicularis.

MINDANAO, Camp Keithley, Lake Lanao, *Mary Strong Clemens s. n.* (type), September, 1907.

Plant much branched, the branches bearing numerous heads of flowers in the axils of the small linear-oblong leaves. On the same plant flower buds and fruits occur. The fruits, which are about 6 mm long, exceed the rigid, nervose bracts. In all the specimens examined the leaves show a strong tendency to fall off, consequently herbarium specimens consist chiefly of naked stems and the

persistent flower heads. The lip is orbicular when spread out, but in its normal state is rather obovate, obtuse. The callus is basal and V-shaped, the wings extend along the margin to the apical third of the lip where they converge.

Podochilus (§ Appendicula) malindangensis sp. nov.

Planta 5 dm alta, robusta, glabra. *Folia* oblongi-lanceolata vel elliptica, disticha, coriacea, 4 cm longa, 1 cm lata. *Inflorescentia* lateralis, 2.5–3 cm longa; rhachis fractiflexus. *Flores* in racemo brevi. *Bracteae* cymbiformes, acutae, 8.5 mm longae, ovario longiores. *Sepala lateralia* mentum obtusum formantia, triangulari-lanceolata, acuta, 3-nervia, 4.5 mm longa, 4 mm lata ad basim. *Sepalum dorsale* lanceolatum, 3-nervium, 4–4.5 mm longum, subacutum. *Petala* oblonga, 1-nervia, 4 mm longa, 1.5 mm lata. *Labellum* ut in P. pendulo, oblongum vel subquadratum, 4 mm longum, 7-nervium.

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4733 Major E. A. Mearns & W. I. Hutchinson*, May 25, 1906, at 1,700 m altitude.

P. malindangensis is a tall, rather strict species which in general aspect resembles *P. micranthus*. The labellum is oblong or subquadrate, obtuse, with a large pocket or cup near the base formed by a transversely situated membrane. The lateral sepals are united at the base and form a rounded mentum. In the type material the characteristically large flowers are borne on lateral peduncles which occur on stems from which the leaves have fallen. Leafy stems destitute of flowers occur on the same plant with the naked flower-bearing stems. It is probable that as the flowering stems are the most mature the leaves fall off during the drying process, but notwithstanding this probability the specimens are in general aspect unlike others of the genus from the Philippines. When dry the flowers are blackish, when fresh they were described by the collectors as "dark-blue."

Podochilus (§ Apista) Robinsonii sp. nov.

Caules 1 dm alti, graciles, basibus foliorum vaginantibus tecti. *Folia* lanceolata, 1.3 cm longa, 2–3 mm lata, coriacea. *Inflorescentia* terminalis. *Pedunculus* cum racemo 3.5 cm longus. *Bracteae* minutae, acutae, 1 mm longae. *Flores* minuti, flavi. *Sepala* 3 mm longa, connata, tubum formantia, partes terminales 1.5 mm longae, liberae, subacutae. *Petala* uninervia, dolabriformia, vel triangula breviter unguiculata, 3.5 mm longa. *Labellum* cordatum ad basim sagittatum breviter unguiculatum, 3-nervium, 2.5 mm longum, 2.25 mm latum.

LUZON, Camarines Province, Maaguas, *Bur. Sci. 6371 C. B. Robinson*, August 27, 1908, altitude above sea 200–400 meters. Here also I refer material collected on Canlaon Volcano, Island of Negros, by *C. S. Banks* in June, 1906, *Bur. Sci. 1137*.

In general aspect this species resembles *P. strictus* Ames and *P. scalpelliformis* Bl. It is easily distinguished from these by its broader leaves, longer racemes and very different petals. The sepals are connate as in *P. scalpelliformis*. The rigid bracts give to the raceme a pectinate aspect. In dried specimens the leaves appear to have been twisted slightly.

176. AGROSTOPHYLLUM Bl.

Agrostophyllum malindangense sp. nov.

Caules usque ad 2.5 dm longi, ad basim 2 mm in crassitudine, fasciculati, teretes, exiles inferne, superne sensim dilatati vaginis foliorum tecti; vaginae foliorum imbricatae, persistentes, nitidae, flavidae, prope apicem caulis inflatae, (in sicco ?) marginibus nigricantes. *Folia* usque ad 1 dm longa, prope basim 4 mm lata, linearia, acuminata, acuta, coriacea, ad basim rotundata, nervo intermedio prominente praedita. *Inflorescentia* terminalis dense capitata globosa, multiflora, 1.5 cm in diametro. *Bracteae* exteriores rigidae, lanceolatae, floribus longiores; bracteae interiores obtusae, floribus breviores, glumaceae. *Pedicelli* cum ovario 5.5 mm longi. *Flores* flavidi, conferti. *Sepala lateralia* oblongi-lanceolata, acuta, uninervia, 3 mm longa, ad basim 2 mm lata. *Sepalum dorsale* simile. *Petala* valde linearia, uninervia, 3 mm longa. *Labellum* carnosum, 3-lobatum, hypochilio obtuso, valde scrotiforme, lamella transversa integra ab epichilio separato. *Epichilium* cupulam formans. *Lobi laterales* minuti, paene obsoleti. *Columna* crassa, 3.5 mm longa.

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4610 Mearns & Hutchinson*, May 25, 1906, altitude 1,700 m.

178. CERATOSTYLIS Bl.

Ceratostylis philippinensis Rolfe ex Ames Orch. 1: 79, with fig.

Among the orchids collected on Mount Mariveles by Elmer D. Merrill and sent alive in 1905 to North Easton was this interesting species which has grown luxuriantly in my collection, forming dense tuffs of semiterete leaves from the axils of which the sweet-scented, snow-white flowers emerge in August and September. The margin of the lip is slightly revolute near the middle and on the disk beyond the middle are two inconspicuous papillose calli.

This species has also been collected recently by *R. C. McGregor, Bur. Sci. 8447*, near Pauai, Benguet Subprovince, Luzon, at an altitude of 2,100 m.

218. PHAIUS Lour.

Phaius flavus Lindl. Gen. Sp. Orch. Pl. 128.

The material which I refer here may be conspecific with *P. philippinensis* N. E. Brown, a species which I have not seen. There are several details, however, in Mr. Brown's description which do not agree with my specimens. The entire lip of my plant suggests *P. philippinensis*, also the thin keels on the disk. On the other hand *P. flavus* is a very variable species and *P. philippinensis* may be one of its variants. Mr. Brown's description refers to the fugaceous floral bracts. In my material the bracts are persistent.

LUZON, Lepanto-Bontoc region, *Bur. Sci. 5616 Dean C. Worcester*, July 8, 1907, flowers with a rather rank odor, yellow, fringe of lip brown-purple.

230. ACANTHOPHIPPIUM Bl.

Acanthophippium Mantinianum L. Lind. & Cogn. Journ. des Orch. 7: 138.

Roots fleshy, elongated. Stems 12 cm long, gradually tapering upward from a broad base, jointed. Leaves 2, plicate, ovate-oblong, petiolate, up

to 3 dm long, 9 cm wide. Raceme 5-flowered, bracts cymbiform up to 3 cm long. Sepals about 3 cm long. Petals rhomboidal, obtuse. Labellum 3-lobed, lateral lobes dolabriform, about 5 mm long, 5 mm wide, middle lobe obtuse, about 7 mm long. Disk lamellate, lamellae 5, fleshy, prominent.

This peculiar species, which was originally introduced from the Philippine Islands, and described by Linden and Cogniaux in "Le Journal des Orchidées" in 1896, has just come to hand from Luzon, where it was collected by Father M. Vanoverbergh. The flowers are yellowish with dark spots and the labellum is nearly white. My knowledge of the species, unfortunately, is based on the original description and not on an examination of the type material. I have seen no other specimen of *Acanthophippium* from the Philippines.

232. PACHYSTOMA Bl.

Pachystoma pubescens Bl. Bijdr. 376.

Pachychilus pubescens Bl. Mus. Bot. Lugd. Bat. 2: 173.

I refer to this species several specimens recently collected in Luzon. They agree with the material figured in detail by Blume and with a Javan plant preserved in the herbarium of the British Museum of Natural History, collected by Horsfield.

LUZON, Cagayan Province, *Bur. Sci. 7969 Maximo Ramos*, April 3, 1909, flowers "dark-purplish:" Lepanto Subprovince, *Bur. Sci. 7050 Ramos*, January 24, 1909, flowers "violet:" Benguet Subprovince, *For. Bur. 10942 H. M. Curran*, January 14, 1909, in grass lands, pine-covered hills, flowers "pink," altitude 1,500 m: Rizal Province, *Bur. Sci. 6774 C. B. Robinson*, May 18, 1909, flowers "lilac, lip golden-yellow except on margin in front."

235. EULOPHIA R. Br.

Eulophia dentata sp. nov.

Mea sententia E. venosae Reichb. f. affinis. *Radices ? Caulis* erectus usque ad 5.5 dm longus, bracteis scariosis vaginantibus instructus; foliis carens. *Bracteae* tubulares, supra dilatatae, acuminatae, setaceae, imbricatae inferne, superne distantes, 2–4 cm longae. Bracteae inflorescentiae scariosae, lineares, setaceae, usque ad 2 cm longae, flore longiores. *Racemus* sublaxiflorus, 7–10 cm longus, circiter 4 cm in diametro. *Flores* albi et purpurei, 12 mm longi, nutantes. *Pedicelli* pergraciles, 5–9 mm longi. Ovarium 5–7 mm longum. *Sepala lateralia* oblonga, 5-nervia, 1.5 cm longa, 3 mm lata, acuta. *Sepalum dorsale* simile, basi leviter attenuatum. *Petala* oblongi-lanceolata, 3-nervia, 12 mm longa, 3 mm lata. *Labellum* ovatum, 3-lobatum, inferne in calcar productum. *Lobi laterales* rotundati, leviter crenulati, circiter 2 mm longi, 2 mm lati, sparsim papillosi; *lobus medius* suborbicularis, margine valde dentatus; discus ad basim leviter tricarinatus, ad medium et prope apicem papillis et processibus numerosis. Papillae et processus inaequales. Processus complanati, usque ad 2 mm longi. *Calcar* obtusum, 3.5 mm longum. *Columna* 4 mm longa, ad apicem dilatata.

LUZON, Bontoc Subprovince, *For. Bur. 17035 H. M. Curran*, January 26, 1909, very common in open grass lands.

From the specimens at hand *Eulophia dentata* appears to be a leafless species closely allied to *Eulophia venosa* Reichb. f.

276. DENDROBIUM Sw.

Dendrobium (§ Aporum) indivisum Miquel Fl. Ind. Bat. 3: 630.

D. lunatum Lindl. in Journ. Linn. Soc. Bot. 3: 4.

This is apparently a common species in the Philippine Islands where it is found growing on trees along the coast and inland. The flattened, erect stems, triangular distichous leaves and terminal inflorescence are quite characteristic. According to the field notes of collectors the small flowers are pale-yellow marked with purple. The lunate labellum and conspicuous callus serve to distinguish this species from its congeners in the Philippines.

In Lindley's Herbarium the Cuming plant, which I take to be the type of *D. lunatum* Lindl., appears to be conspecific with *D. indivisum*. Lindley's sketch of the flower agrees very well with the figure on *Plate XIII* of Presl's "Reliquiae Haenkeanae," although the general habit of the Cuming specimen is not exactly like that of the majority of the specimens recently collected in the Philippines.

SULU ARCHIPELAGO, *Merrill 3003*, plants growing on low rocky bluffs along the seashore, 1907. LUZON, Province of Bataan, Lamao, Mount Mariveles, *For. Bur. 2753 T. E. Borden*, March, 1905, on tree trunks in mossy forest, 900 m above sea level: Province of Zambales, Mount Pinatubo, *Bur. Sci. 2616 Foxworthy*, April 25, 1907, on trees on very dry mesa, 700 m above sea level.

Dendrobium platycaulon Rolfe in Kew Bull. (1892) 139.

This species bloomed in the orchid collection of the Bureau of Science in November, 1909. According to notes which accompany the specimens submitted for identification the exact locality from which they were obtained and the name of the collector who discovered them are unknown. They certainly were Philippine. As Mr. Rolfe states, this species resembles *Dendrobium lamellatum*. The pseudobulbs, however, are longer and narrower in relation to their length and the flowers are larger than in that species. In the notes which are appended to the original description of *D. platycaulon* the flowers are said to exceed an inch in length. In the specimens I have examined the flowers are scarcely an inch long, but in other details they agree very well with Mr. Rolfe's description. *D. platycaulon* is a curious species with flattened pseudobulbs, which are about 11 cm long, 2.5 cm wide and only a few millimeters thick; they are contracted into a slender terete base; the leaves are oblong-lanceolate, larger than the pseudobulbs and somewhat similar to them in outline. The specimens examined were apparently 3- or 4-leaved. The flowers are nearly white, and fragrant when fresh. They close in a short time and turn yellow. They are few in number and borne near the apex of the leafless pseudobulbs.

Dendrobium scopa Lindl. Bot. Reg. (1842) Misc. 55.

What I take to be specimens of this species have been received from Mr. W. S. Lyon who collected them in Tarlac Province. Mr. Lyon in his field notes describes the plants as terrestrial, growing among rocks. The flowers, which were open in June, were white, cinnamon-scented, the finely fringed lip being straw-yellow. The flowers are not showy but on account of the peculiarly fringed lip are of exceptional interest and very curious. The sepals and petals are similar, linear-oblong, about 15 mm long. The labellum is oblong, the apex broken up into a delicate spreading fringe the filaments of which are about 5 mm long.

Lindley's type specimen, for an excellent sketch of which I am indebted to Doctor Prain, is perhaps stouter than my plants, but in other respects matches them perfectly. The labellum of *D. scopa* is well illustrated in Lindley's herbarium by a colored drawing. In outline and in general aspect this drawing agrees very well with the labellum of the plants collected by Mr. Lyon.

Dendrobium scopa is referred to in J. J. Smith's "Die Orchideen von Java" as probably related to *D. comatum* Lindl. From the specimens at hand it would seem to be more nearly allied to *D. angulatum* in the form of the lip, but differs from that species in detail.

LUZON, Tarlac Province, *W. S. Lyon 110.*

276. SARCOPODIUM Lindl.

In the "Orchid Review" for August, 1910 (**18**: 237) Mr. R. A. Rolfe gives a list of twenty-one species, usually referred to *Dendrobium*, which he regards as constituents of a distinct genus, namely *Sarcopodium*. This genus was originally proposed by Lindley for the inclusion of a small group of species which Reichenbach f. referred to *Bulbophyllum*. At present only three Philippine species of *Sarcopodium* are known. All of these have recently been described. *S. acuminatum* Kränzl. was the first to be discovered, *S. Lyonii* Rolfe (*S. acuminatum* var. *Lyonii* Kränzl.) the second, and *S. stella silvae* Kränzl. & Loher, a species which I have not seen, the third.

In its brief history *Sarcopodium Lyonii* has accumulated an interesting synonymy as follows:

Sarcopodium Lyonii R. A. Rolfe in Orch. Rev. **18**: 240.
Dendrobium Lyonii Ames Orch. **2**: 177.
D. acuminatum Kränzl. Orchis **2**: 73, not Rolfe.
Sarcopodium acuminatum var. *Lyonii* Kränzl. in Fedde Rep. **7**: 40.

In view of Doctor Kränzlin's treatment of *S. Lyonii*, Mr. Rolfe's opinion in the "Orchid Review" is of interest. He says *S. Lyonii* is allied to *S. acuminatum*, but has larger rosy-carmine flowers with a darker lip. "It has been confused with the preceding,[7] and I believe includes all the plants which have been recently exhibited under the name *D. acuminatum*, also the figure in Gard. Chron. 1907, ii, p. 210, *fig. 88;* 1909, ii. p. 150, *fig. 64;* Gard. Mag. 1909, pp. 649, 660, with fig.; Journ. Hort., 1902, ii, p. 291, with fig.; Orchis ii, p. 73, *t. 16.*"

280. PHREATIA Lindl.

Phreatia prorepens Reichb. f. Otia Bot. Hamb. (1878) 54.

Up to the present I had seen only the material in the Gray Herbarium identified by Reichenbach and the specimens collected by Merrill on Mount Halcon. The collection under consideration was made by McGregor and is of unusual interest as it is composed of numerous specimens which exhibit a wide range of variation, some of the scapes approximating 2 dm in length. The variation in the leaves is also notable, ranging from the ligulate form characteristic of the type to broadly lanceolate. As a rule the scapes exceed the leaves considerably and bear spikes of white flowers which appear to be more rigid than in the other material I have examined. The structure of the flowers is very similar in the plants from Mount Halcon and in those collected by McGregor, so that variation seems to be purely vegetative. *P. prorepens* is closely related to *P. acuminata* J. J. Smith, from which it appears to differ chiefly in the size of the floral parts. In Lindley's herbarium at Kew there are two Javan species of *Phreatia* mounted on the same sheet. One of these, a plant collected by Junghuhn (no. 207), belongs to § *Ebulbosae*. The other, a plant collected by Lobb, belongs to § *Bulbosae* and is probably conspecific with *P. acuminata*. In habit it closely resembles *P. prorepens* and may be a form of that species. From my material it is quite impossible to distinguish *P. acuminata* from *P. prorepens*. In "Die Orchideen von Java," J. J. Smith distinguishes *P. acuminata* by the floral bracts being shorter than the ovaries. In my material I find some of the bracts conspicuously shorter than the ovaries, and some longer.

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[7] *Sarcopodium acuminatum.*

LUZON, Benguet Subprovince, Pauai, *Bur. Sci. 8363 R. C. McGregor*, June, 1909.

383. CLEISOSTOMA Bl.

Cleisostoma Kunstleri Hook. f. Icon. Pl. IV 4: *pl. 2335*.

I refer to this species, which was originally collected at Perak by Kunstler, material from the Island of Polillo. Leaves coriaceous, oblong, at the apex unequally bilobed, 2 dm long, 3–4.4 cm wide. *Scape* terete, 2.5 mm in diameter. *Bracts* few, obtuse, 5 mm long. *Inflorescence* laxly paniculate, many-flowered. *Floral bracts* minute, acute, much shorter than the pedicels of the purplish flowers. *Lateral sepals* oblong, obtuse, 3.5 mm long, 1.25 mm wide. *Upper sepal* oblong or oblanceolate, obtuse, 5 mm long, 1.5 mm wide. *Petals* linear-oblong, obtuse, 4.5–5 mm long, 1 mm wide. *Labellum* saccate, 3-lobed. Sac scrotiform, 3 mm long, with a posterior scale within, the scale oblong, membranaceous, bifid at the tip, each division obscurely emarginate. Lateral lobes minute, triangular, less than 1 mm long, middle lobe suborbicular, 1.5 mm long.

POLILLO, *Bur. Sci. 10444 R. C. McGregor*, September 25, 1909, on tree trunks.

286. BULBOPHYLLUM Thou. (§ *Cirrhopetalum*).

Bulbophyllum chryseum comb. nov.

Cirrhopetalum chryseum Kränzl. in Fedde Rep. 8: 97.

This is a member of the section *Cirrhopetalum*, characterized by a solitary flower at the summit of the scape. The only other described species from the Philippines which are thus characterized are the ones very briefly described by Lindley, namely *B. antenniferum* and *B. maxillare*, which are remarkable on account of their very large flowers.

I have not seen the type of *B. chryseum* but my material agrees almost in detail with Kränzlin's description. Furthermore the collections in the Bureau of Science Herbarium contain no other species of the small, single flowered type which belongs to § *Cirrhopetalum* that would indicate *B. chryseum* to be one of a group. Consequently I am morally sure that my identification is correct. The only other described species of § *Cirrhopetalum* from the Philippines, characterized by a solitary flower, are the two mentioned above, and these are sharply distinguished by the extraordinary size of their flowers, these being among the largest in the section.

I have seen no material from the Philippines which agrees with *B. antenniferum* and *B. maxillare*. In the Herbarium of the Bureau of Science there are two plants which approach them in aspect but which represent very different species. My knowledge of *B. antenniferum* and *B. maxillare* is based on sketches of the types kindly given to me by Doctor Prain.

LUZON, Rizal Province, *Bur. Sci. 3076 Maximo Ramos*, flowers yellow. (Specimen flowering in Manila, January 21, 1908).

Bulbophyllum Cumingii Reichb. f. in Walp. Ann. 6: 261.

Cirrhopetalum Cumingii Lindl. Bot. Reg. 1843 sub *t. 49;* Bot. Mag. *t. 4996.*

This species which Lindley described from specimens collected in the Philippines by Cuming is apparently a rarity. The tetragonal pseudobulbs, oblong, coriaceous leaves, elongated scape and umbel of purplish flowers are characteristic.

NEGROS, Cadiz, *Bur. Sci. 7334 A. Celestino*, March, 1909, *For. Bur. 5227 Danao & Aspillera*, June, 1906.

Bulbophyllum Makoyanum Reichb. f. in Gard. Chron. 1879, 1: 234 in note.

Cirrhopetalum Makoyanum Reichb. f. in Gard. Chron. 1879, 1: 234; Bot. Mag. *t. 7259.*

This interesting species, which differs chiefly in color and minor details from *B. Cumingii*, has been discovered in the Philippines. The umbels of yellow flowers spotted with purple, which, according to the collector's notes, give the plant the aspect of a sun-flower, are very distinctive. The elongated, narrowly linear lateral sepals radiate from the center of the umbel. The petals and upper sepal are fringed with yellow hairs. The labellum is fleshy and smooth.

B. fimbriatum, which is a closely allied species, has two conspicuous teeth at the summit of the column.

POLILLO, *Bur. Sci. 10438 R. C. McGregor*, September 28, 1909, flowers pale-yellow speckled with burnt-carmine. MINDANAO, *Rev. R. F. Black s. n.*

299. DIPODIUM R. Br.

Dipodium paludosum Reichb. f. Xenia 2: 15.

There are two specimens in the Herbarium of the Bureau of Science which according to materials at hand appear to be referable to this species, one from Negros, the other from Mindanao. The details of the labellum agree with the figure in the "Botanical Magazine" (*t. 7464*), although the lateral lobes or teeth are rather longer, measuring 4 mm in length. Unfortunately I possess no authentic material of *D. paludosum*, consequently my identification is not so sure as I could wish. The identity of the genus, however, is beyond doubt and its addition to the Philippine flora through the specimens under consideration is of importance.

MINDANAO, Province of Surigao, *F. H. Bolster*, September, 1906. NEGROS, Himugaan, River, *For. Bur. 7313 H. D. Everett*, April 10, 1907, 20 m altitude above the sea.

376. LUISIA Gaudich.

Luisia Ramosii sp. nov.

Planta ±3 dm alta. *Caulis* plus minus 4 mm in crassitudine, vaginis foliorum tectus. *Folia* teretia, obtusa, in sicco valde rugosa, plus minus 1 dm longa, in sicco usque ad 3 mm in crassitudine, erecta vel adscendentia. *Vaginae* tubulosae, substriatae, persistentes. *Flores* flavidi, labello purpureo. *Pedunculi* breves, crassi, 2 cm longi. *Bracteae* *inflo-*

rescentiae rigidae, obtusae. *Sepala lateralia* cymbiformia, oblonga, carinata, 6 mm longa, 3 mm lata; carina in apiculum uncinatum producta. *Sepalum dorsale* elliptico-lanceolatum, 3-nervium, obtusum, 6 mm longum, 3.5 mm latum, breviter apiculatum. *Petala* falcato-ovata, obtusa, 3-nervia, 6 mm longa, 4 mm lata, nervis lateralibus ramosis. *Labellum* trilobum, 6 mm longum; *lobus medius* triangulari-ovatus, 4 mm longus, 5 mm latus; *lobi laterales* erecti columnam amplectentes, rotundati, 2 mm longi, 2 mm lati. *Columna* crassa.

LUZON, Cagayan Province, *Bur. Sci. 7970 Maximo Ramos*, April 20, 1909.

Luisia Ramosii is a stout plant, in habit similar to *L. teretifolia*. The lateral sepals are strongly keeled near the apex, the keel passing into an elongated, uncinate apicula.

Three species of *Luisia* are now known to be natives of the Philippine Islands: *L. valida* Reichb. f., *L. Foxworthyi* Ames and the present one. Of these *L. valida* is not known to me. The description does not agree with any of the Philippine material I have examined, still its brevity leaves much to be desired.

402. TAENIOPHYLLUM Bl.

Taeniophyllum Merrillii sp. nov.

Radices crassae, numerosae, plus minus 4 mm in crassitudine. *Folia* 0. *Scapus* filiformis, usque ad 1.7 cm longus, hispidulus, nudus. *Flores* albi. *Racemus* brevis, 3–4 mm longus. *Bracteae* minutae 0.5 mm longae. *Pedicelli* plus minus 1 mm longi. *Sepala lateralia* oblongi-lanceolata, 1-nervia, 1.25–1.5 mm longa, 0.75 mm lata. *Sepalum dorsale* lineari-oblongum. *Petala* lanceolata, 1 mm longa. *Sepala lateralia petalaque* prope basim connata. *Labellum* saccatum, integerrimum, 3 mm longum, ad apicem rotundatum.

LUZON, Province of Bataan, Mount Mariveles, *Merrill 3878*, August, 1904, altitude above sea level about 800 m.

This is a curious species composed of fleshy yellow-green roots 3–7 cm long, and filiform scapes. The minute flowers appear to open in succession. The lateral sepals appear to arise wholly from the lip and look like lateral lobes as their middle nerve continues from the base into the sac.

THE PHILIPPINE JOURNAL OF SCIENCE, C. BOTANY.
Vol. VI, No. 1, March, 1911.

CONSPECTUS CYPERACEARUM INSULARUM PHILIPPINENSIUM: CYPERACEAE-CARICOIDEAE.

By G. KÜKENTHAL.
(*Coburg, Germany.*)

Es ist erstaunlich, welche Fülle neuer Entdeckungen die intensive botanische Durchforschung der Philippinen in den letzten Jahren gezeitigt hat. Erst drei Jahre sind vergangen, seitdem in diesem Journal[1] eine von C. B. Clarke zusammengestellte Liste der im Kew Herbarium vertretenen *Cyperaceen* des Inselreiches veröffentlicht wurde und schon ist ein solcher Zuwachs neuen Materials zu verzeichnen, dass eine ergänzende Revision notwendig erschien. Durch die Güte des Herrn E. D Merrill, Government Botanist, dem ich auch an dieser Stelle meinen ergebensten Dank abstatte, ist mir das gesammte in Manila befindliche Material der *Caricoideae* zugänglich gemacht worden. Weitere Beiträge erhielt ich von Herrn A. D. E. Elmer in Manila. Die älteren Typen früherer Sammler habe ich gelegentlich meiner Studien für das "Pflanzenreich" in Berlin und Kew eingesehen, so dass die folgende Liste, welcher auf Wunch des Herrn Merrill ein Schlüssel vorausgeht, auf möglichste Vollständigkeit Anspruch erheben darf. Sie umfasst zunächst die *Caricoideae*. Die anderen Unterfamilien sollen später folgen. Ein vorgesetztes * bedeutet, dass die betreffende Art oder Form in Clarke's Liste fehlt. Jeder Art ist das Citat ihrer Stelle in meiner Monographie[2] hinzugefügt.

Subfamilia CARICOIDEAE PAX.

1. **Rhacheola secundaria ex utriculo exserta unciformis** ....1. ***Uncinia***
1. **Rhacheola plerumque deficit: si adest, inclusa rarissime exserta, sed tunc semper recta occurrit** .... 2. ***Carex***

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[1] **Cyperaceae of the Philippines; A List of the Species in the Kew Herbarium.** ***This Journal* 2 (1907) *Botany* 77-110.**

[2] **Cyperaceae-Caricoideae, in A. Engler, Das Pflanzenreich, Heft 38 (1909).**

1. UNCINIA Pers.

Species unica:

* 1. **Uncinia rupestris** Raoul var. **capillacea** Kükenth. in Engl. Pflanzenreich 38 (1909) 64.

LUZON, Benguet Subprovince, Mount Pulog, *For. Bur. 16140 Curran, Merritt, & Zschokke.* MINDANAO, District of Davao, Todaya, Mount Apo, *Elmer 10637.*

Zum ersten Male ist damit de dem australischen Florenreiche eigentumliche Gattung *Uncinia* auf den Philippinen nachgewiesen. Die typische Form von *Uncinia rupestris* bewohnt Tasmanien und die Südinsel von Neuseeland, die var. *capillacea* die letztere und die Stewart Insel.

2. CAREX L.

CLAVIS SUBGENERUM.

1. Spicula unica terminalis .... Subg. I. *Primocarex* p. 58
1. Spiculae plures.
    2. Spiculae semper bisexuales (apice ♂ basi ♀): cladoprophyllum (i. e. prophyllum axis 2 vel 3 ordinis) in spiculis omnibus utriculiforme. Subg. II. INDOCAREX p. 58
    2. Spiculae sexu distinctae vel bisexuales; cladoprophyllum (saltem in spiculis inferioribus semper) ocreaeforme .... Subg. III. EUCAREX p. 61

Subgenus I. PRIMOCAREX Kükenth.

Species unica:

1. **Carex rara** Boott subsp. **capillacea** Boott Illustr. 1 (1858) 44; Kükenth. l. c. 102.

LUZON, Benguet Subprovince, *Loher 705;* Pauai, *Bur. Sci. 4260 Mearns, Bur. Sci. 8333 McGregor, Merrill 4732, 6626, 6632;* Mount Pulog, *Merrill 6612.*

Area: Süd- und Ostasien; Neu Süd Wales.

Carex rara Boott und *C. capillacea* Boott sind nur in ihren extreme Formen deutlich von einander geschieden, zahlreiche Bindeglieder verwischen die Grenzen.

Subgenus II. INDOCAREX Baillon.

Clavis specierum.

1. Inflorescentia spicata; bracteae deficiunt; spiculae omnes e cladoprophyllo simul nucem fertilem includente enatae .... 2. *C. nikkoensis*
1. Inflorescentia paniculata; bracteae longe vaginantes adsunt; spiculae omnes e cladoprophyllo vacuo enatae.
    2. Spiculae cylindricae 3 ad 6 cm longae .... 3. *C. baccans*
    2. Spiculae vix super 1.5 cm longae.
        3. Spiculae numerosae ovatae vel oblongae in paniculas longas dispositae.
            4. Paniculae partiales explicatae.
                5. Squamae ♀ in aristam longam excurvam excurrentes; utriculi ovati subinflato-trigoni abrupte rostrati .... 4. *C. indica* var. *fissilis*
                5. Squamae ♀ acutae interdum mucronatae; utriculi vere trigoni subsensim rostrati.
                    6. Paniculae laxae; squamae fuscae; utriculi lanceolato-elliptici in rostrum longum gracile marginibus parce scabrum excurrentes. 5. *C. filicina* var. *ceylanica*
                    6. Paniculae subdensae; squamae saturate ferrugineae; utriculi elliptici marginibus infra medium ad apicem hispiduli in rostrum sublatum abeuntes .... 6. *C. Rafflesiana*

4. Paniculae partiales contractae .... 7. *C. pycnothyrsos*
3. Spiculae pauciores globosae vel ovatae in spicas breves dispositae.
    4. Bracteae inflorescentiam longe superantes; squamae longe aristatae; utriculi rhomboidales longe rostrati.
        5. Spiculae divaricatae ovatae; utriculi glabri multicostati.
        8. *C. fuirenoides* var. *cirrhulosa*
        5. Spiculae oblique patentes globoso-ovatae; utriculi pubescentes tenuiter nervosi .... 9. *C. nodiflora*
    4. Bracteae breves; squamae mucronatae; utriculi ovales breviter rostrati.
    10. *C. rhizomatosa*

*2. **Carex nikkoënsis** Franch. & Sav. Enum. Pl. Japon. **2** (1879) 132, 558; Kükenth. l. c. 252.

Luzon, Benguet Subprovince, Pauai, *Merrill 6631*.

Bisher nur aus Japan bekannt.

3. **Carex baccans** Nees in Wight Contrib. (1834) 122; Kükenth. l. c. 258.

Luzon, Benguet Subprovince, ohne nähere Standortangabe, *Loher 706, 1948*: Mount Tonglon (Santo Tomás), *Bur. Sci. 5350, 5457 Ramos, Mearns s. n., Elmer 6270;* Baguio, *Williams 1973, For. Bur. 15602 Curran;* Batan, *Bur. Sci. 5908 Ramos;* Pauai to Baguio, *Merrill 4794;* Mount Pulog, *Merrill 6543, Bur. Sci. 8442, 8889 McGregor, For. Bur. 16139 Curran, Merritt, & Zschokke:* Lepanto Subprovince, Mount Data, *Merrill 4515, 4555*.

Area: Vorderindien und Monsungebiet.

*4. **Carex indica** L. var. **fissilis** (Boott) Kükenth. l. c. 264.

Palawan, Iwahig, *Bur. Sci. 844 Foxworthy*.

Area: Monsungebiet und Polynesien.

5. **Carex filicina** Nees var. **ceylanica** (Boeck.) Kükenth.

C. ceylanica Boeck. in Linnaea **11** (1876) 341; Kükenth. l. c. 279.

Luzon, ohne Standortangabe, *Loher 707 B:* Abra Subprovince, *Bur. Sci. 7213 Ramos:* Province of Laguna, Mount Banajao, *Bur. Sci. 6582 Robinson, Bur. Sci. 2404 Foxworthy:* Benguet Subprovince, Mount Pulog, *For. Bur. 16136 Curran, Merritt, & Zschokke*. Negros, Canlaon Volcano, *Phil. Pl. 544 Merrill*.

Area: Ceylon.

Ich habe mich davon überzeugt, dass *C. ceylanica* Boeck. als eigene Art nicht zu halten ist, sie gehört augenscheinlich in den Formenkreis von *C. filicina*, von welcher sie durch "paniculae partiales oblongo-ovatae laxiores, ramuli oblique patentes, utriculi superne parce scabri" abweicht.

Forma 1, **saturata** (C. B. Clarke) Kükenth. l. c. 275 (pro var. *C. filicinae*).

Luzon, Province of Tayabas, Mount Banajao, *For. Bur. 866 Klemme, Whitford 949*. Negros, Canlaon Volcano, *Phil. Pl. 545 Merrill*.

Area: Sumatra, Java.

Forma 2, **depauperata** Kükenth. l. c. 275.

Luzon, Lepanto Subprovince, Mount Data, *Merrill 4513:* Benguet Subprovince, Pauai, *Merrill 4743;* Mount Pulog, *Bur. Sci. 8837 McGregor, Merrill 6499, 6507, 6615, For. Bur. 16138 Curran, Merritt, & Zschokke;* Mount Tonglon, *Mearns s. n.* Mindoro, Mount Halcon, *Merrill 6200*.

Area: Java.

6. **Carex Rafflesiana** Boott in Trans. Linn. Soc. **20** (1846) 132; Kükenth. l. c. 282.

Carex continua C. B. Clarke in Philip. Journ. Sci. **2** (1907) Bot. 107, partim.

Luzon, Benguet Subprovince, ohne Standortangabe, *Bur. Sci. 2739 Mearns;*

Baguio, *Elmer 6039;* Pauai, *Merrill 4742, Bur. Sci. 8378 McGregor, Bur. Sci. 4259 Mearns;* Bugias, *Merrill 4669:* Province of Pampanga, Mount Arayat, *Merrill 4221:* Province of Laguna, Mount Banajao, *Bur. Sci. 6076 Robinson;* Province of Bataan, Mount Mariveles, *Whitford 1121.* PALAWAN, Mount Victoria, *Bur. Sci. 665, 679 Foxworthy;* Mount Pulgar, *Bur. Sci. 554 Foxworthy, For. Bur. 3890 Curran.*

Area: Sumatra, Java, Celebes, Queensland.

Var. **scaberrima** (Boeck.) Kükenth. l. c. 283.

Carex scaberrima C. B. Clarke in Philip. Journ. Sci. **2** (1907) Bot. 107.

BATANES ISLANDS, Batan, Mount Iraya, *Bur. Sci. 3801 Fénix.* LUZON, Benguet Subprovince, Pauai to Baguio, *Merrill 4795;* Pauai, *Bur. Sci. 4258, 4481 Mearns;* Baguio, *For. Bur. 4868 Curran;* Mount Pulog, *For. Bur. 16161 Curran, Merritt, & Zschokke:* Province of Albay, *Cuming 936;* Mount Mayon, *Bur. Sci. 2920, 2932, 2934, 2936 Mearns:* Province of Zambales, Mount Pinatubo, *Bur. Sci. 2539 Foxworthy;* Mount Tapulao, *For. Bur. 8137 Curran & Merritt:* Province of Laguna, Mount Maquiling, *Bur. Sci. 9736 Robinson.* MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4764 Mearns & Hutchinson.*

Area: Sumatra, Java, Celebes, Molukken.

Var. **continua** (C. B. Clarke) Kükenth.

Carex continua C. B. Clarke in Philip. Journ. Sci. **2** (1907) Bot. 107, partim et verisimiliter etiam in Hook. f. Fl. Brit. Ind. **6** (1894) 717; Kükenth. l. c. 281.

Inflorescentia depaniculata multo laxior. Paniculae secundariae in ambitu latiores, rami saepe divaricati. Utriculi in faciebus glabrescentes minores brevius rostrati.

LUZON, ohne Standortangabe, *Loher 707, 708, 709, 710:* Province of Bataan, Mount Mariveles, *Whitford 189, 1145, Bur. Sci. 1593 Foxworthy, Merrill 3197, Elmer 6985:* Province of Nueva Vizcaya, *Bur. Sci. 8221 Ramos:* Benguet Subprovince, Baguio, *Williams 1241.* MINDORO, Mount Halcon, *For. Bur. 4384 Merritt.*

Area: Vorderindien, Oberburma, Centralchina.

Auch *Carex continua* C. B. Clarke muss ich nach dem mir jetzt vorliegenden reichlicheren Material als Art einziehen. Soweit die Philippinenpflanzen in Betracht kommen, verteilt sich Clarke's *C. continua* auf die typische *C. Rafflesiana* und auf die hier beschriebene Varietät.

7. **Carex pycnothyrsos** Kükenth. sp. nov.

Rhizoma abbreviatum lignosum. Culmus 80 cm altus firmus triqueter laevis. Folia culmo breviora 4–6 mm lata plana supra aspera rigida, vaginae fuscae. Inflorescentia subdepaniculata 22 cm longa. Paniculae partiales 7 mediae binae caeterae singulae in ambitu oblongae contractae superiores spiciformes approximatae sessiles sequentes remotae exserte pedunculatae erectae, pedunculi graciles sed stricti scabridi. Rhachis dense hispida; ramuli erecti inferiores pauci- superiores monostachyi. Bracteae foliaceae inflorescentiam superantes vaginantes. Spiculae oblongo-ovatae 6–7 mm longae androgynae (pars ♂ fere abscondita) densiflorae bracteolis squamiformibus aristatis suffultae. Squamae ♀ ovatae fuscae e carina flava in aristam brevem excurrentes. Utriculi squamas plus duplo superantes oblique patentes lanceolato-elliptici trigoni 4 mm longi pallide virides fusco-tincti plurinervosi glabri vel superne parce scabri basi contracti marginibus e medio ad apicem hispiduli in rostrum longum latiusculum grosse bidentatum sensim desinentes. Nux oblongo-elliptica. Stylus in collo insidens. Stigmata 3.

NEGROS, Canlaon Volcano, altitude 1,200 m, *Phil. Pl. 543 Merrill*, April, 1910.

Diese schöne Art hat habituell grosse Ähnlichkeit mit *Carex Lindleyana* Nees. Die dichtgewimperten Ränder der Schläuche und deren breitere Schnäbel erweisen aber ihre nähere Beziehung zu der Gruppe *Hispidulae*.

8. **Carex fuirenoides** Gaudich. var. **cirrhulosa** (Nees) Kükenth. l. c. 287.

Carex fibrata Boott apud Vid. Phan. Cuming. Philip. (1885) 156.

LUZON, Province of Nueva Vizcaya, Quiangan, *Merrill 109*. CEBU, *Cuming 1764*.

Die typische Form auf den Mariannen-Inseln.

9. **Carex nodiflora** Boeck. in Engler's Bot. Jahrb. **5** (1884) 516; Kükenth. l. c. 288.

Carex Cumingii Vid. Phan. Cuming. Philip. (1885) 156; C. B. Clarke in Philip. Journ. Sci. **2** (1907) Bot. 107.

LUZON, *Wichura, Loher 704, 712:* Province of Isabela, *Bur. Sci. 8006 Ramos:* Province of Nueva Ecija, *Cuming 1408:* Province of Laguna, Los Baños, *Alberto s. n., Elmer 8304:* Province of Benguet, Twin Peaks, *Elmer 6449:* Province of Rizal, Antipolo, *Bur. Sci. 3350 Ramos*.

Endemisch.

10. **Carex rhizomatosa** Steud. in Zoll. Verz. Ind. Archip. (1854) 60; Kükenth. l. c. 289.

Carex Cumingiana Steud. Syn. Cyp. (1855) 206.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 323:* Province of Rizal, *Bur. Sci. 2700 Ramos*. NEGROS, *Cuming 1795*. MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 1096*.

Area: Assam, Oberburma, Tonkin, Molukken.

Subgenus EUCAREX Coss. et Germ.

Clavis specierum.

1. Utriculi erostrati vel brevirostres, rostrum ore truncatum vel emarginatum raro leviter bidentatum.

  2. Squamae ♀ fuscae; stigmata 2.

    3. Spiculae 4 ad 6, terminales ♂, laterales ♀ (apice saepe breviter ♂); utriculi dense glandulosi enervii breviter rostrati .... 11. *C. phacota*

    3. Spiculae 12 ad 20, androgynae; utriculi eglandulosi multicostati erostrati .... 12. *C. Graeffeana*

  2. Squamae ♀ sordide luteae: stigmata 3.

    3. Bractea ima breviter vaginans; spiculae oblongae vel oblongo-ovatae subdensiflorae .... 13. *C. breviculmis* subsp. *Royleana*

    3. Bractea ima longe vaginans; spiculae ♀ anguste cylindricae sublaxiflorae.

      4. Spiculae omnes androgynae .... 14. *C. cryptostachys*

      4. Spiculae sexu distinctae.

        5. Utriculi elliptici; filamenta dilatata basi connata .... 15. *C. tristachya* var. *pocilliformis*

        5. Utriculi lageniformes; filamenta libera.

          6. Culmus centralis 5 ad 6 cm altus; folia 2 mm lata; spiculae ♀ 1.5 cm longae .... 16. *C. rhynchachaenium*

          6. Culmus lateralis; folia ad 8 mm lata; spiculae ♀ 4 cm longae .... 17. *C. ligata* var. *nexa*

1. Utriculi longius rostrati, rostrum ore bidentatum.

2. Stigmata 2 .... 18. *C. brunnea*

2. Stigmata 3.

3. Inflorescentia paniculata; squamae ♀ fuscae.

4. Utriculi anguste lanceolati 5 ad 6 mm longi .... 19. *C. turrita*

4. Utriculi elliptici 3 mm longi .... 20. *C. Merrillii*

3. Inflorescentia spicata; squamae ♀ rufae vel pallidiores.

4. Rhizoma stoloniferum; spiculae ♀ densi- et multiflorae; utriculi inflato-trigoni .... 21. *C. subtransversa*

4. Rhizoma caespitosum; spiculae ♀ oblongae vel ovatae, pauciflorae.

5. Spiculae omnes androgynae, densiflorae; utriculi rhomboidales 7 mm longi multinervosi marginibus anguste alati .... 22. *C. Ramosii*

5. Spiculae terminales ♂, laterales ♀ vel apice breviter ♂, laxiflorae; utriculi ellipsoidei trigoni.

6. Culmus centralis; spiculae superiores subradicales, foemineae ovatae; bracteae breves .... 23. *C. Loheri*

6. Culmus lateralis; spiculae apice fastigiatae, foemineae oblongae; bracteae inflorescentiam longe superantes .... 24. *C. Elmeri*

* 11. **Carex phacota** Spreng. Syst. 3 (1826) 826; Kükenth. l. c. 350.

LUZON, Benguet Subprovince, Baguio, *Bur. Sci. 2505 Mearns*, *Williams 1246*.

Area: Vorderindien, Hinterindien, Südjapan, Java.

12. **Carex Graeffeana** Boeck. in Flora 58 (1875) 22; Kükenth. l. c. 403.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 441*: Benguet Subprovince, Pauai, *Merrill 6622*, *Bur. Sci. 8370 McGregor*; Baguio, *Elmer 8532*; Mount Pulog, *For. Bur. 16132 Curran, Merritt, & Zschokke*; ohne Standortangabe, *Loher 699*: Province of Nueva Vizcaya, *Bur. Sci. 8174*, *8177 Ramos*. MINDANAO, District of Davao, Mount Apo, *Copeland 1250*.

Area: Fidschi Inseln.

* 13. **Carex breviculmis** R. Br. subsp. **Royleana** Nees ex Wight Contr. (1834) 127; Kükenth. l. c. 469.

LUZON, Benguet Subprovince, Mount Pulog, *Merrill 6609*, *Bur. Sci. 8853 McGregor*.

Area: Vorderindien, Hinterindien, Tonkin, Formosa, China, Korea, Amurgebiet, Japan.

Var. **kingiana** (Léviellé et Vaniot) Kükenth. l. c. 470.

LUZON, Benguet Subprovince, Pauai, *Merrill 6628*.

Area: Japan.

* 14. **Carex cryptostachys** Brongn. in Duperrey Voy. Coquille Bot. (1828) 152; Kükenth. l. c. 471.

LUZON, Province of Rizal, *Bur. Sci. 1760 Ramos*: Province of Laguna, Mount Banajao, *Bur. Sci. 9758 Robinson*: Province of Sorsogon, *Elmer 7306*.

Area: Malacca, Java, Tonkin, Formosa.

* 15. **Carex tristachya** Thunb. var. **pocilliformis** (Boott) Kükenth. l. c. 473.

LUZON, Province of Benguet, Pauai, *Merrill 6629*, *6630*; Mount Pulog, *Merrill 6606*, *Bur. Sci. 8856 McGregor*.

Area: Formosa, Korea, Japan.

16. **Carex rhynchachaenium** C. B. Clarke ex Merrill in Govt. Lab. Publ. (Philip.) 35 (1905) 5; Kükenth. l. c. 480.

LUZON, Province of Bataan, Mount Mariveles, *Elmer 6983*: Province of Pampanga, Mount Arayat, *Phil. Pl. 512 Merrill*.

Proxima *C. breviscapae* C. B. Clarke, differt culmo minore, foliis angustioribus spiculis paucioribus brevioribus, utriculis longioribus pubescentibus. A *C. ligata* Boott differt culmo centrali, foliis bracteisque culmum longe superantibus.

Endemisch.

* 17. **Carex ligata** Boott var. **nexa** (Boott) Kükenth. l. c. 474.

Luzon, Bontoc Subprovince, Bauco, in forests 1.600 m. alt., *Vanoverbergh 496*.

Area: Hongkong, Centralchina.

18. **Carex brunnea** Thunb. Fl. Jap. (1784) 38; Kükenth. l. c. 599.

Luzon, ohne Standortangabe, *Loher 711:* Province of Benguet, Mount Tonglon, *Merrill 4819:* Province of Zambales, Mount Tapulao, *For. Bur. 8152 Curran & Merritt:* Province of Pampanga, Mount Arayat, *Merrill 4223, 4224:* Province of Bataan, Mount Mariveles, *Merrill 3196, 3880, Whitford 1346, Bur. Sci. 1592 Foxworthy:* Lepanto Subprovince, Mount Data, *Merrill 4529, 4514.*

Area: Mascarenen, Vorderindien, Hinterindien, Tonkin, China, Korea, Japan, Celebes, Australien.

Alle Exemplare von den Philippinen zeigen in Spelzen und Schläuchen ein helleres zimmtbraun als die typische Form und gehen in die folgende Varietät über.

Var. **subtelogyna** Kükenth. in Fedde Repert. **8** (1910) 8.

Spiculae laxiores. Squamae dilutiores longiores acuminatae. Utriculi 5 mm longi longius stipitati glaberrimi vel perparce scabri perlonge rostrati.

Luzon, Benguet Subprovince, Mount Pulog, *Merrill 6505, Bur. Sci. 8866 McGregor;* Pauai, *Merrill 4731.* Negros, Canlaon Volcano, *Merrill 6974.*

19. **Carex turrita** C. B. Clarke in Journ. Linn. Soc. **37** (1904) 13.

Carex Walkeri Arn. var. *turrita* Kükenth. l. c. 564.

Luzon, Benguet Subprovince, *Loher 700:* Abra Subprovince, *Bur. Sci. 7288 Ramos.*

Endemisch.

Macht mir jetzt nach Einsicht vollständigerer Exemplare doch den Eindruck einer eigenen Art.

* 20. **Carex Merrillii** Kükenth. in Fedde Repert. **8** (1910) 7.

Luzon, Benguet Subprovince, Pauai, *Merrill 6623.*

Aus der Verwandtschaft der vorigen Art, *C. Daltoni* Boott und *C. inaequalis* Boott.

Endemisch.

21. **Carex subtransversa** C. B. Clarke in Philip. Journ. Sci. **2** (1907) Bot. 108; Kükenth. l. c. 614.

Luzon, Benguet Subprovince, Pauai, *Merrill 4780.*

Area: Formosa (*Kawakami & Mori 2298, 2385*).

Am nächsten mit *Carex japonica* Thunb. und *C. mollicula* Boott verwandt, von beiden durch die schiefabstehenden nicht runzeligen plötzlich in den Schnabel zusammengezogenen Schläuche getrennt.

* 22. **Carex Ramosii** Kükenth. in Fedde Repert. **8** (1910) 8.

Luzon, Province of Rizal, Morong, *Bur. Sci. 1434 Ramos;* Antipolo, *Phil. Pl. 536 Ramos.*

Endemisch.

23. **Carex Loheri** C. B. Clarke in Journ. Linn. Soc. Bot. 37 (1904) 14; Kükenth. l. c. 487.

LUZON, Lepanto Subprovince, Mount Data, *Merrill 4488*; Benguet Subprovince ohne näheren Standort, *Loher 701, 702, 703, 703bis*; Mount Pulog, *Merrill 6605, 6607, 6506*; Baguio, *Elmer 8582*: Province of Zambales, Mount Tapulao, *Bur. Sci. 5133 Ramos*: Province of Laguna, Mount Banajao, *Bur Sci. 9838 Robinson, Bur. Sci. 2403 Foxworthy.*

Forma **grandimascula** Kükenth. forma nova.

Spicula ♂ lineari-ellipsoidea 1.5 cm longa longe pedunculata.

LUZON, Benguet Subprovince, Pauai, *Merrill 4729*.

Endemisch.

* 24. **Carex Elmeri** Kükenth. in Fedde Repert. 8 (1910) 326.

LUZON, Benguet Subprovince, Baguio, *Elmer 8444*. NEGROS, Canlaon Volcano, *Merrill 6972*.

Nahe mit *C. Loheri* verwandt, aber durch zentrale Blattrosette, breitere am Rande nicht weissschülferige Blätter, an der Spitze gedrängt stehende Ährchen und lange Bracteen geschieden.

Endemisch.

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PAPUAN FERNS COLLECTED BY THE REVEREND COPLAND KING.

By EDWIN BINGHAM COPELAND.
(From the College of Agriculture, Los Baños, P. I.)

At various times during the past three years, I have received from the Reverend Copland King, of Ambasi, Papua, very interesting collections of ferns from different places in eastern New Guinea. Part or all of these collections were first sent to Mr. F. Manson Bailey, who has published some notes on them, but has not described any of the numerous novelties. As I was at first requested by Mr. King to await any work Mr. Bailey might wish to do with them, I have let these collections accumulate, without hitherto publishing anything on them. In consideration of the very limited knowledge concerning the flora of this region, it seems advisable now to list the entire collection, inserting the novelties in their natural places.

The strongest impression gained by the study of these ferns is one of surprise at their completely Malayan character. This is so striking that it would have been almost as easy to believe that the whole collection had been made in Celebes, or even in Mindanao. This observation applies equally to the species and to the larger groups. Of the determined species, and there is a residuum of hardly ten still to be identified, only three are known farther east or south and not in the Malay archipelago. On the other hand, there are twenty-two species which find here their most easterly known point, but have been collected in Malaya. Of all the extensive botanical evidence against the naturalness of Wallace's line between Malaya and New Guinea, this is the most conclusive.

As a matter of fact, the fern flora of all Polynesia is Malayan in general character, as evidenced by the fact that King's collection contains eighty-seven species found both east and west of New Guinea. There are also sixteen species previously known in New Guinea only, and forty-two species described here as new.

MARATTIACEÆ.

MARATTIA Swartz.

1. **Marattia Kingii** Copel. species nova.

Fronde teste King 1 m alta; pinnis 20–25 cm longis, rhachi deorsum albicante et sparse paleacea, sursum alata; pinnulis sessilibus, late cuneatis, acuminatis, majoribus ca. 35 mm longis, 9 mm latis, lanceolatis, acute serrulatis, rigide coriaceis, infra albidis et ad costam venasque minute paleaceis; venis simplicibus; soris medialibus, 1–1.5 mm longis, sporangiis utroque latere 4 vel 5, indusio lacero conspicuo, receptaculo elliptico.

No. 214, Goodenough Bay, altitude 1,200 m.

Distinguished from its apparently nearest relative, *M. melanesica* Kuhn, by much finer serration, veins standing at nearly a right angle, and the fine scaliness, characters easily recognized even on small fragments.

2. **Marattia grandifolia** Copel. species nova.

Rhachi pinnae glabra, angustissime alata; pinnulis breviter (ca. 2 mm) stipitatis stipite subvelutino glabrescente, maximis ultra 20 cm longis, ultra 3 cm latis, basi inaequale cuneato-rotundata, acuminatis, acute leviter serratis, herbaceo-coriaceis, glabris, infra pallidis; venis simplicibus haud pellucidis; soris submarginalibus, ca. 2 mm longis, sporangiis utroque latere 9–12, indusio inconspicuo, scarioso, receptaculo oblongo-lineare. Species M. macrophyllae De Vr. affinis, quâ pinnulis majoribus durioribus, venulis opacis distinguenda.

No. 305.

Of the numerous forms sometimes grouped under *M. fraxinea*, this is near only to the *M. macrophylla* named above. The leaflets of *M. grandifolia* are broadest below the middle.

OPHIOGLOSSACEÆ.

OPHIOGLOSSUM Linnaeus.

1. **O. reticulatum** L.

No. 232, Ambasi.

Most tropical lands.

HELMINTHOSTACHYS Kaulfuss.

1. **H. zeylanica** (L.) Hooker.
No. 189, Ambasi.
India to New Caledonia.

SCHIZAEACEÆ.

SCHIZAEA Smith.

1. **S. dichotoma** (L.) Smith.
Nos. 137, 243, Ambasi.
Polynesia to Madagascar.

King states that this form, *S. Forsteri* Spr., is readily distinguishable when growing, as the branches rise in a cluster, while in typical *S. dichotoma*, which he has found at Lakekamu, they spread or even bend down. The man in the herbarium is never likely to know his ferns as the good collector does.

2. **S. digitata** (L.) Swtz.
No. 110, Waria River in German New Guinea, altitude 900 m.
Fiji to India; and Madagascar (?).

LYGODIUM Swartz.

1. **L. circinnatum** (Burm.) Swtz.
Nos. 152, 236, Ambasi.
Queensland to northern India.

2. **L. trifurcatum**: see under *L. dimorphum*.
Melanesia, Celebes.

3. **L. dimorphum** Copel. species nova.

Valde dimorphum; ramis nanis fere obsoletis; frondulae sterilis stipitula 1–1.5 cm longa, frondulae fertilis longiore: frondula sterile furcata, ramo inferiore fere ad basin furcato, segmentis 15–20 cm longis, 15–20 mm latis, unilateraliter valde auriculatis, acuminatis, minute serrulatis, coriaceis, glabris, nitidis; frondula fertile furcata, ramis pinnatis vel rarius iterum furcatis, pinnis plerumque pinnatis interdum digitatis, pinnulis simplicibus vel furcatis rarius iterum furcatis, lamina sterile nulla; spicis 2–3 mm longis, sporis tuberculatis.

No. 134, in part, *147, 363* and *364*, all from Ambasi.

This plant is a near relative of *L. trifurcatum* Baker, from which it is most readily distinguished by the complete suppression of the sterile lamina on the fertile leaflets. I believe the first specimen sent me to be mixed with *L. trifurcatum*, although I can not identify the latter with the plant or plants distributed under that name, collected in German New Guinea by Hahn. The group seems to me to contain several species; but the ease of collecting mixtures in this genus makes especially careful field work a prerequisite to reliable determination of any incomplete specimens. The type specimen of *L. dimorphum*, in my herbarium, has sterile and fertile leaflets on the one rachis. King states that this fern is very common, but I do not know to which of the forms sent this applies.

No. 364 is one of the curious intermediates often found in *Lygodium*, the segments or pinnules being partly fertile. The change is rather abrupt, the fertile part promptly losing all the lamina. These pinnules have the plan of ordinary sterile ones.

4. **Lygodium Kingii** Copel. species nova.

Species L. scandenti Swtz. affinis; rachidibus ubique minute pubescentibus; ramo nano subnullo; pinnulis ad pedicellarum capita conspicue incrassata articulatis, late cuneatis vel truncatis, haud cordatis, lanceolatis, 4–6 cm longis; sporis tuberculatis.

No. 362, from Mamba river; *Nos. 282, 178.*

King sends this as the "inland variety" of *L. scandens*, but says "*L. scandens* along side this, and the contrast is marked." The two species are very distinct, *L. scandens* having naked axes, the dwarf branch slender and 3 mm more or less in length, the thickening of the head of the pedicel evident after, but not before, the fall of the pinnule, and the spores white, and reticulate, rather than tuberculate in appearance. My specimen, ticketed "*L. microphyllum* Sw.," collected by Hahn at Yabim, German New Guinea, is a mixture of sterile *L. scandens* and fertile *L. flexuosum*.

5. **L. scandens** Sw.

No. 133, Ambasi.

Africa to Polynesia.

6. **L. japonicum** Sw.

No. 146, Ambasi.

Australia to India and Japan.

A sterile specimen collected at Mamba may be a hybrid of *L. japonicum* and *L. circinnatum*, but might be a monstrous *L. dimorphum*, the sterile pinna taking the plan of the fertile.

7. **L. Versteegii** Christ in Rés. de l'Exp. Sci. Néerl. à la Nouv. Guinée 8 (1910) 163.

Christ does not mention the auricled bases of the segments, which are conspicuous though small on all of King's specimens, but the plants are otherwise alike. One of King's specimens, *No. 360*, is entirely sterile, and the segments are 40 cm long. The stalk of the pinna is suppressed; that of the segments is up to 1 cm long, and usually provided with separate auricles.

Nos. B. 46, from Gira; *360*, from Lakekamu; and *361*, from Mamba.

The fertile frond of *No. 361* has the veins free, while that of *B. 46* has a row of areolae.

GLEICHENIACEAE.

GLEICHENIA Smith.

1. **G. linearis** (Burm.) Clarke.

No. 158, Ambasi.

Pantropic.

2. **G. hirta** Bl.

No. 188, Goodenough Bay, altitude 1,200 m.

Moluccas, Java, the Philippines.

This plant is coriaceous, but otherwise typical.

CYATHEACEAE.

DICKSONIA L'Héritier.

1. **D. papuana** F. v. M., det. by Maiden.
No. 230, Ambasi; *No. 350*, Lakekamu.

This fern is reduced by all recent authors to *Saccoloma sorbifolium* (Sm.) Christ. I doubt the identity of these two; but be that as it may, the fern is a *Dicksonia* rather than a *Saccoloma*. If one does not like to call it *Dicksonia*, it is probably *Cystodium* J. Sm. The mass of scales on and about the bases of the stipes is altogether *Dicksonia*-like. I have examined numerous sporangia from both of King's collections and find that a majority have a somewhat oblique annulus interrupted by the pedicel. A smaller number have the annulus uninterrupted. The stomium is like that of other *Dicksoniae*.

CYATHEA Smith.

1. **C. fusca** Baker.
Nos. 181, 246, 277.
New Guinea.

The veins and costae are not glabrous. I know this fern only by description.

2. **C. contaminans** (Wall.) Copel.
No. 215, in open country.
Malaya, India.

Nos. 227 and *356* are other species of which the specimens are insufficient for certain identification. *No. 227* is very probably undescribed.

HYMENOPHYLLACEAE.

HYMENOPHYLLUM Smith.

1. **H. ooides** F. Muell. & Bak. (?)
No. 106, Goodenough Bay.
New Guinea.

This fern is so determined by F. Manson Bailey, and I presume that he is acquainted with the original plant. In that case the original description is peculiar in several respects, especially in calling the pinnae lanceolate; those of this plant are rather elliptic.

No. 246 is another very slender plant more than 30 cm high and less than 3 cm wide; it agrees better than *No. 106* with the description of *H. ooides*. It is a relative of *H. blumeanum* Spr.

2. **H. dilatatum** (Forst.) Sw.
No. 186, Goodenough Bay.
Malaya to New Zealand.

Identification not positive as the specimens are sterile.

3. **H. Reinwardtii** v. d. Bosch.
No. 210, Goodenough Bay, altitude 1,200 m.
Java, Sumatra.

Smaller and much more crisped that the form figured by van den Bosch, but otherwise not different.

4. **H. laminatum** Copel. spec. nova.

Rhizomate repente pube purpurea vestito; stipite 4 ad 5 cm alto sursum pubescente; fronde ca. 15 cm alta, 2.5 ad 3.5 cm lata, lanceolata, rhachi anguste 2–4-alata; pinnis lanceolatis, acutis, inferioribus brevistipitatis, fere ad costam pinnatisectis; segmentis oblanceolatis vel obovatis, apice incisis sparse serrulatis, tenuiter rigidis, rufis; venis venulisque late et usque ad marginem undulato-cristatis; soris secus rhachin ordinatis, basi cristatis, ore bifido, laciniis denticulatis.

No. 341, Lakekamu.

Nearest *T. fuscum* (Blume) v. d. Bosch, differing from this relative in the narrower pinnae, more prolonged lamellae, occasionally serrate margin and denticulate lobes of the indusium.

5. **H. (Leptocionium) ovatum** Copel. spec. nova.

Rhizomate filiforme glabrescente; stipite 1 cm alto, rhachique sursum alata nigris, glabrescentibus; fronde ovata, 4 cm alta, 3 cm lata, obtusa; pinnis utroque latere ca. 9, proximis et interdum imbricatis, sessilibus, apice rotundatis, fere ad costam pinnatifidis; segmentis 1–2-lobatis, proximis; lobis ca. 0.8 mm latis, obtusis, sparse serratis, margine haud crispa, glabris, coriaceis, brunneis; indusio infra medium bifido, laciniis late ovatis, superne dentatis.

No. B. 32, Gira.

Clearly distinguished from all related species by the broad, very compact, and decidedly coriaceous little fronds.

6. **H. serrulatum** (Pr.) C. Chr. ?

No. B. 31, Gira, Yodda, etc.

New Guinea and the Philippines.

The specimens are small and sterile. The rachis is winged throughout, but this may not be so on adults.

TRICHOMANES Linnaeus.

1. **T. trichophyllum** Moore.

No. 109, Goodenough Bay, altitude 900 m.

Sterile, but probably this species. *No. S. 12* has the fruit character of this species, which it probably represents, though the segments are narrowly linear rather than bristle-like.

Borneo, New Guinea, New Caledonia.

2. **T. grande** Copel. spec. nova.

Rhizomate erecto, stipitibus confertis, alatis, 20 cm altis; fronde 20–35 cm alta vel ultra, 10–15 cm lata, quadripinnatifida, rhachibus alatis, sparse puberula; segmentis ultimis 0.5 mm latis, planis, obtusis; soris paratactis, indusio utroque latere subcarinato, infundibuliforme, limbo dilatato et interdum subrevoluto.

Philippines: *Copeland 1739* (type), *Cuming 162* in part, *Copeland 2054*, *Merrill 6060*, *Elmer 8333*, *Bur. Sci. 10289*, and many other collections.

Papua, *King 351*, Lakekamu (?)

This was included with some other species in *T. anceps* Hooker. *T. millefolium* Presl was based on another plant, also included in *Cuming 162*, which is *T. maximum* Bl. This is more like *T. rigidum* Swtz. which however is a much smaller plant, less divided, with shorter indusium, and is very doubtfully present in the Orient.

The Papuan specimen has much broader pinnae than those of the Philippines; I have not made it a type because I have not the rhizome.

3. **T. aphlebioides** Christ.
No. 193.
New Guinea.

No. 68 of Kärnbach's collection, from "Nuselang u. d. Sattelberges Weg nach Schleo," distributed as *T. bauerianum*, is also this species. *T. bauerianum*, judging by our Norfolk Island specimens, is altogether distinct, both from this fern and from *T. apiifolium* Presl.

4. **T. dentatum** v. d. B. (?)
No. 353, Lakekamu.
Polynesia.

I doubt the identity of this specimen with the species named, but it is very near it.

5. **T. latipinnum** Copel. spec. nova.

Rhizomate repente, 25 mm crasso, pilis purpureo-nigris acicularibus dense vestito; stipite 15–20 cm alto, rhachique atropurpureis, decidue pilosis deinde hispidis; fronde trigona, 15 cm alta, 10 cm lata, quadripinnatifida; pinnis et pinnulis deltoideo-lanceolatis, pinnulis primariis et secundariis acroscopicis maximis; pinnulis $^{\text{II}}$ incisis, segmentis ultimis 0.1–0.2 mm latis, 0.5–1 mm longis, acutis, glabris, coriaceis; soris paratactis, indusiis 1 mm longis, 0.6 mm latis, infra medium alatis, truncatis, receptaculo paullo extruso.

No. 108, Waria River, German New Guinea, altitude 900 m.

Easily distinguished from the preceding, and from *T. rigidum* in all forms known to me, by the very broad pinnae and pinnules.

6. **T. cupressoides** Desv.
No. 107, Waria River, German New Guinea, altitude 900 m.
Westward to Madagascar.

This agrees fairly well with van den Bosch's plate of *T. obscurum* Bl., but all our Javan specimens supposed to be this species have bilabiate indusia.

7. **T. pallidum** Bl.
No. 185, Goodenough Bay.
India to Polynesia.

8. **T. densinervium** Copel. spec. nova.

Cephalomanes stipite valido vix 10 cm alto, fronde 18 cm alta, vix 4 cm lata, sursum sensim angustata, pinnis proximis valde imbricatis, infimis haud remotis, obliquis, apice rotundatis, ciliatis, venis angulo acuto orientibus, proximis, crassis, furcatis et inferioribus acroscopicis iterum furcatis; soris partem superiorem frondis occupantibus, acroscopicis, ad pinnam quamquam usque ad 8, uniformibus, indusiis compresso-infun-

dibuliformibus, truncatis, limbo paullo dilatato vel interdum recto, receptaculo exserto.

No. 150.

Differs evidently from *T. javanicum* Bl., *T. atrovirens* Kze., and *T. Zollingeri* v. d. B. in the coarse veins, which stand at a much more acute angle to the costa. The frond is also conspicuously more compact and the pinnae more rounded.

9. **T. (Cephalomanes) acrosorum** Copel. spec. nova.

Stipitibus confertissimis, 1–2 cm altis; fronde 6–10 cm alta, 1.5–2 cm lata, rhachi pilosa glabrescente; pinnis 10–12 mm longis, basi cuneatis, apice rotundatis, dentatis et interdum partitis, venatione sublaxa; pinnis supremis fertilibus, 1–3-soratis, lamina carentibus, indusio 2.5–3 mm longo, infra limbum plus minus dilatatum vix 1 mm crasso; receptaculo usque ad 7 mm exserto.

No. 352, Lakekamu.

The racemose or narrowly paniculate sori make this very distinct from any species hitherto known.

10. **T. (Cephalomanes) Kingii** Copel. spec. nova.

Rhachi anguste alata, glabra; pinnis laceratis; paniculo breve; indusio conico, vix 2 mm alto, 1 mm vel ultra lato, limbo haud dilatato; aliter praecedenti simile.

No. (*?*) Lakekamu.

I have only one frond of this plant, but it has such a combination of distinctive characters that I do not believe it can vary into *T. acrosorum*.

11. **T. humile** Forst.

No. 136, on the coast.

New Zealand to Formosa.

No. 340 is a related species, but the specimen is sterile.

POLYPODIACEÆ.

DRYOPTERIS Adanson.

The great body of the species of this genus fall into three groups, which are for the most part natural and easily recognized. As there are such perfect series of intermediates that the majority of my contemporaries have no disposition to hold these as distinct genera, and as I do not regard them as natural in detail, that is, as absolutely homophyletic, I am not concerned as to the generic validity of the names chosen for these groups. They are:

§ 1. LASTRAEA. Fronds decompound or veinlets forked. This is in my opinion the most primitive group. From it have been derived *Tectaria* and *Polystichum*, which in turn have their daughter-genera.

§ 2. THELYPTERIS. Fronds as a rule deeply bipinnatifid with simple veinlets, having the aspect of the next section, but the veins free.

§ 3. NEPHRODIUM. Pinnae not so deeply cut as to prevent anastomosis of at least the basal veinlets.

§ Lastraea.

1. **D. setigera** (Bl.) O. Kuntze.
No. 155.
Polynesia to India.

2. **D. Kingii** Copel. spec. nova.

Lastraea gregis D. syrmaticae, stipite fusco, 30 cm alto, deorsum paleis linearibus ultra 2 cm longis ornato, sursum rhachique fere glabris; fronde ca. 30 cm alta, 15 cm lata; pinnis inferioribus vix minoribus, maximis ca. 10 cm longis, 2–2.5 cm latis, subsessilibus, acuminatis, fere ad costam incisis sinu acuto; segmentis ca. 15 mm longis, 5 mm latis, falcatis, acutis, integris, coriaceis, fere glabris; venis utroque latere 5 vel 6, furcatis; soris medialibus, indusio inviso.

No. 149, Tamata and coast.

Characterized by the texture and the acute, entire segments, separate almost to the costa.

§ Thelypteris.

3. **D. quadriaurita** Christ.
No. 220, opposite Samarai.
Mindanao.

4. **D. wariensis** Copel. spec. nova.

Fronde ca. 45 cm alta, 20 cm lata, rhachi minute puberula, fusca, pinna apicale aliis simile; pinnis infimis paullo brevioribus, maximis ultra 15 cm longis, 3.5 cm latis, brevistipitatis, acuminatis, fere ad costam pinnatifidis; segmentis 18 mm longis, 2–3 mm latis, infimis vix diminutis, plerisque fere rectis, integris, obtusis, herbaceis, ubique glabris; venis utroque latere usque 20; soris medialibus, indusio carente, sporangiis nudis.

No. 101, Waria River, in German New Guinea.

This may be near *D. tuberculata,* but is not at all glandular. The base of the stipe is wanting.

5. **D. basisora** Copel. spec. nova.

Parte superiore stipitis fusca, sulco pubescente, aliter glabra; fronde ultra 60 cm alta, ca. 35 cm lata; rhachi pubescente; pinnis infimis remotis, deflexis, paullo brevioribus, maximis medialibus, 22 cm longis, 2.5–3 cm latis, brevistipitatis, acuminatis, profunde pinnatifidis, lamina costale utroque 1–1.5 mm lata; segmentis infimis reductis, majoribus 16 mm longis, 3.5 mm latis integris, acutis, rectis vel subfalcatis, coriaceis, venis et sparsissime lamina infra pubescentibus; venulis utroque latere usque ad 23, simplicibus; soris costularibus, indusiis nudis, nigris, persistentibus.

No. 304.

This species has very much the aspect of *D. erubescens,* from which it is distinguished by the indusia.

6. **D. falcatipinnula** Copel. spec. nova.

Stipite pallide brunneo, 30 cm alto; fronde 25–30 cm alta, 30 cm lata, rhachi sparse praecipue sursum pubescente, apud insertiones pinnarum adenophora, pinna apicale aliis subsimile sed latiore; pinnis ca. 7-paribus, oppositis, 12 cm longis, 15 mm latis, subsessilibus, valde acuminatis, infimis nec remotis nec diminutis, fere ad costam pinnatifidis; segmentis infimis brevioribus, majoribus 10–12 mm longis, linearibus, vix acutis, falcatis, integris, coriaceis, ad apices et in sinubus ciliatis, supra glabris, infra ad venas et venulas sparse pilosis; venis utroque latere ca. 12, simplicibus; soris inframedialibus, indusio brunneo, piloso, persistente.

No. 114, in lowlands.

Near *D. loheriana*, but less pubescent, and with narrower and more deeply cut pinnae.

§ NEPHRODIUM.

7. **D. cucullata** (Bl.) Christ.

No. 163, common in grass land.

Polynesia to the Seychelles.

8. **D. arida** (Don) O. Kuntze.

No. 172, in grass land.

Malaya, India.

9. **D. paraphysata** Copel. spec. nova.

Fronde 75 cm alta, 30 cm lata; pinna apicale aliis simile, rhachi fusca, minute sordide pubescente; pinnis infimis utroque latere una (aut pluribus) in auriculam abrupte reductis; maximis 18 cm longis, basi 2 cm latis, dein sensim ad apicem acuminatum attenuatis, rectis, brevi-pedicellatis, ca. ½ ad costam pinnatifidis, costa dense, lamina sparsissime setosis, segmentis truncatis, subcoriaceis; venis simplicibus, utroque latere ca. 7, quarum plerumque 2 anastomosantibus; soris inframedialibus; indusiis inconspicuis (non carentibus), paraphysibus multis, grande glanduloso-capitatis; sporangiis nudis; sporis spinis paucis longis ornatis.

No. 306.

Near *D. truncata* (Presl) O. Kuntze; the latter is less hairy, has a conspicuous indusium, wants the copious paraphyses, and has the spores covered with short tubercles or spines.

10. **D. arbuscula** (Willd.) O. Kuntze, sensu lat.

No. 171.

Polynesia to India.

D. arbuscula as generally construed contains several apparently distinct plants.

11. **D. dichrotricha** Copel. spec. nova.

Stipite 40 cm alto, brunneo, ubique sparse villoso; fronde ultra 60 cm alta, 30–35 cm lata, apice pinnatifida longa; rhachi pilis albidis minutis et aliis ultra 1 mm longis dense vestita; pinnis utroque latere ca. 20, infimis reductis, majoribus brevi-stipitatis, fere horizontalibus, ca. 2 cm latis, acuminatis, basi truncatis, ½ ad costam pinnatifidis; segmentis rotundatis, subfalcatis, integris, ubique minute pilosis et glandulosis; 2 vel 3 venis anastomosantibus; soris medialibus; indusiis persistentibus, pallidis, setosis, margine glandulifera; sporangis ad annulos nudis, alibi interdum sparse setosis; sporis reticulatis.

No. 294 (type); *No. 219*, mainland opposite Samarai.

Near *D. adenophora* C. Chr., but the glandular spot inconspicuous and surfaces hairy; and to *D. polycarpa* Christ, but the attachment of the indusium short and the pubescence different; different from most of the *D. parasitica* group, in the glandular indusia. At the base of the frond are one pair of auricles and one or two pairs of less reduced pinnae.

12. **D. (Mesochlaena) polycarpa** Christ.
No. 159.
Malaya, Polynesia.

I have sometime favored the recognition of *Mesochlaena* as a genus, but do not now incline that way. It is too difficult to distinguish this plant from *D. adenophora* C. Chr.

13. **D. aquatilis** Copel. spec. nova.

Stipite vix 15 cm alto, fusco, basi nigro, sub lente minute appresso-setoso; fronde ca. 35 cm alta, 10 cm lata, apice 5 cm longo inciso-serrato, rhachi minute appresso-setosa; pinnis remotis, utroque latere ca. 14, stipitatis, ca. 6 cm longis, 7 mm latis, valde acuminatis, basi inaequilateraliter cuneatis, acroscopice auriculatis, leviter serratis, membranaceis, costis et sparsissime venis setosis, lamina glabra, membranacea; venulis utroque latere 2 vel 3, sat irregulariter anastomosantibus; soris infimis oppositis proximis vel contiguis, superioribus medialibus; indusio orbiculare, sinu manifeste vel saepius occulto.

No. 182, under flood level of creeks.

Perfectly intermediate between *D. lineata* (Bl.) C. Chr. and *D. salicifolia* (Wall.) C. Chr.; the latter sometimes has the pinnae slightly auriculate. *D. salicifolia* has at least sometimes a rudimentary indusium which seems to have been overlooked.

14. **D. prolifera** (Retz.) C. Chr.
No. 128.
Polynesia to Africa.

15. **D. triphylla** (Swtz.) C. Chr.
No. 322, Mamba.
Queensland to India.

16. **D. urophylla** (Wall.) C. Chr.
No. 258, not typical.
Polynesia to India.

TECTARIA Cavanilles.

1. **T. ferruginea** (Mett.) Copel. comb. nova.
Phegopteris ferruginea Mett. Ann. Mus. Lugd.-Bat. 1 (1864) 224.
No. 264.
New Guinea.

I have sometime since published the opinion that *Tectaria* is derived from a *Dryopteris* of the group of *D. dissecta;* this species is so near that group that at first sight I did not suspect its being a *Tectaria*. It impresses me as easily the most primitive known representative of its genus.

2. **T. malayensis** (Christ) Copel.
No. 359, Lakekamu.
Western Malaya and the Philippines.

3. **T. cesatiana** (C. Chr.) Copel. comb. nova.
Aspidium cesatianum C. Chr. Index (1905) 68.
No. 161, Ambasi; *No. 348*, Lakekamu.
New Guinea.

Originally described by Baker, as *Aspidium beccarianum;* this specific name is not transferred because of the earlier *Polypodium beccarianum* Cesati, which must also be *Tectaria*.

4. **T. Menyanthidis** (Presl) Copel.
Nos. 169, 180, Ambasi.
New Guinea, Philippines, Solomon Ids.
Distinguished from *T. crenata* by the somewhat scattered sori.

5. **T. decurrens** (Presl) Copel.
No. 251, Ambasi.
Polynesia to India and China.

6. **T. papuana** Copel. spec. nova.

Stipite ca. 45 cm alto, nigro, nitido; fronde deltoidea, pinnata, ca. 40 cm alta, 30 cm lata; pinnis infimis stipitatis, deltoideis, cordatis, subfalcatis, acutis; sequentibus utroque latere 1, rotundato-adnatis, late lanceolatis, 4 cm latis, 15 cm longis, subfalcatis; pinna apicale tripartita, segmento mediale ca. 20 cm longo, 5 cm lato; pinnis subsinuatis, coriaceis, supra nisi ad costas glabris, infra minute puberulis olivaceis; venis ad marginem attingentibus, reticulatione venularum minuta; soris grandibus, praecipue inter venas biseriatis, supra conspicuis, indusiis peltatis, glandulosis, persistentibus.

No. 160.

Near *T. tripartita* (Baker *ut Nephrodium*) but not identical unless the diagnosis of that species is particularly poor. I have a New Caledonia fern determined as *Aspidium tripartitum* which differs from *T. papuana* only in being thinner and more ample; the two are easily conspecific. But neither has the indusia sagenioid or glabrous, and there are minor differences.

7. **T. irregularis** (Presl) Copel.
No. 175, Mamba; *No. 259*.
Malaya, Fiji.

8. **T. leuzeana** (Gaudich.) Copel.
No. 257.
Polynesia to Asia.

HEMIGRAMMA Christ.

H. grandifolia Copel. spec. nova.

Fronde pinnata ca. 30 cm alta et lata, longe stipitata; pinnis oppositis utroque latere 2 vel 3; pinnis sterilibus vel segmentis earum oblanceolatis, acuminatis; infimis 1 vel 2 furcatis, apicale trifida, frondis fertilis pinnis infimis usque ad 15 cm longis, 2 mm latis, simplicibus, sporangiis laminam obtegentibus.

No. 328, Lakekamu.

A very distinct species, the sterile frond preserving in large measure the form of *Tectaria crenata*, from which, or from near which I consider the genus to be descended.

STENOSEMIA Presl.

1. **S. aurita** (Sw.) Presl.
No. 235.
Malaya, Solomon Islands.

LEPTOCHILUS Kaulfuss.

1. **L. cuspidatus** (Presl) C. Chr.
No. 144, on the coast; *No. 269* is a very young plant, probably of this species.
Polynesia to the Seychelles.

2. **L. heteroclitus** (Presl) C. Chr.
Nos. 265, 284.
Melanesia to India.

3. **L. axillaris** (Cav.) Kaulfuss.
No. 216, Ambasi.
Westward to southern India.

LOMAGRAMMA J. Sm.

1. **L.** sp. perhaps *L. lomarioides*, which should be found in this region.
No. 334, Sogere.
There is no sterile frond.

DIPTERIS Reinwardt.

1. **D. conjugata** Reinw.
No. 151, Ambasi.
Polynesia to Asia.

ATHYRIUM Roth.

1. **A. esculentum** (Retz.) Copel.
No. 254. A small frond, only the lowest veinlets anastomosing.
Polynesia to India.

2. **A. accedens** (Bl.) Milde.
Nos. 179, 292.
Polynesia to Africa.

3. **A. cordifolium** (Bl.) Copel.
No. 245.
Polynesia to Africa.

4. **A. sorsogonense** (Presl) Milde.
No. 320, Lakekamu.
Malaya to India; new to New Guinea.

5. **A. cyatheifolium** (Rich.) Milde.
No. 331, Lakekamu.
New Guinea to Luzon.

6. **A. pallidum** (Bl.) Milde.
No. 365, Mamba.
Queensland, Malaya.

7. **A. crenato-serratum** (Bl.) Milde.
No. 344, Lakekamu.
Malaya; new to New Guinea.

BLECHNUM Linnaeus.

B. orientale L.
No. 157.
Polynesia to India.

Blechnum sp., near *B. Moorei* C. Chr.
No. 104, Goodenough Bay, altitude 300–600 m.
Very likely a new species, but near the above which is New-Caledonian.

PHYLLITIS Ludwig.

1. **P. (Triphlebia) longifolia** (Pr.) O. K.*
No. 191.
Malaya, Papua.

2. **P. (Diplora) mambare** (Bailey) v. A. v. R. (?)
No. 287. This determination was given Mr. King in Sydney. The largest fronds are less than 10 cm long and not serrate; the stipes of the larger ones bear free leaflets below the body of the frond.
New Guinea.

ASPLENIUM Linnaeus.

1. **A. acrobryum** Christ Rés. de l'Exp. Sci. Néerl. à la Nouv.-Guinée 8 (1910) 150.
No. 120 A. Common on the coast.
Described from Noord-rivier.

This specimen is smaller than the type, being about 30 cm long and 4–5 cm wide, with the prolonged tip shorter. The tips of the veins are free.

2. **A. Phyllitidis** Don.
No. 286.
Malaya, Philippines, India.

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* This is the fern commonly so called.

3. **A. papuanum** Copel. spec. nova.

Rhizomate repente, 1 mm crasso, viride, nigro-striato, paleis minutis sparsis; stipitibus 1 cm inter se distantibus, ca. 3 cm longis deorsum paleis minutis angustis vestitis; fronde ca. 15 cm alta, 25 mm lata, simplice, acumine obtuso producto, crenata, herbacea, infra albida, glabra; venis obliquis, remotis, liberis; soris a costa fere ad marginem protensis; indusio lato pallido.

No. 287.

This differs from most of the simple-leaved species in the very slender rhizome and herbaceous texture. It differs from *A. comosum* Christ of the same region in texture and size and in several details. *A. concolor* Hook., and *A. amboinense* Willd. have stout rhizomes and tufted stipes.

The spores are finely reticulate, and sparingly and irregularly tuberculate, but not spiny; which distinguishes it from several species of the group.

4. **A. tenerum** Forst. var. **acuminatum.**

No. 248.

Polynesia to India.

5. **A. Kingii** Copel. spec. nova.

Euasplenium, stipite alto, 4 mm crasso, sulcato, sursum glabro, griseo-nigro; fronde ultra 50 cm alta, pinnata; pinnis utroque latere 5, infimis stipitatis furcatis, aliis subsessilibus integris, ca. 20 cm longis, ca. 5 cm latis, abrupte acuminatis, basin versus (furcatis exceptis) aequalibus, obscure crenatis, herbaceis, glabris; venis furcatis; soris ca. 2 cm longis, nec costam nec marginem attingentibus; indusio atro-brunneo, angusto.

No. 357, Lakekamu; *No. 300* is an immature specimen of the same, the basal pinnae not forked.

The spores have a hyaline cover, and are not spiny. The species is apparently very distinct, and easily recognized by its large, broad, thin pinnae, even though the forking of the lowest is not constant.

6. **A. pellucidum** Lam.

No. 226.

Polynesia to Madagascar.

7. **A. macrophyllum** Sw.

No. 169, common on coast.

Polynesia to the Comores.

No. 315, from Taupota, is a frond with narrow, almost entire pinnae, which may be a variety of this variable species.

8. **A. cuneatum** Lam.

No. 260.

Pantropic.

9. **A. affine** Swtz.

Nos. 239, 279.

Polynesia to the Comores.

10. **A. obtusatum** Forst.
No. 120.
Australia to Chile.
My specimen is insufficient for positive determination, but is accompanied by this name. The rachis is broadly winged.

11. **A. Lauterbachii** Christ. (*A. obtusilobum* Hook. non Desv., *A. oceanicum* C. Chr.)
No. 222, Goodenough Bay, altitude 1200 m.; *No. 354*, Lakekamu.
Polynesia to Celebes.
No. 354 has on the same plants typical fronds of *A. Lauterbachii* and of *A. oceanicum*. This is an example of the not rare event that an author, believing he describes a new species, really gives the first valid name to one already long known.

12. **A. scandens** J. Sm.
No. 342, Lakekamu.
Fiji to Luzon.

STENOCHLAENA J. Smith.

1. **S. palustris** (Burm.) Bedd.
No. 167, Ambasi.
Polynesia to the Asiatic continent.

2. **S. Kingii** Copel.

Lomariopsis, caule 1 cm crasso, inerme, paleaceo; stipite non articulato, 20 cm longo, paleaceo dein glabrescente; pinnis frondis sterilis multijugis, ca. 16 cm longis, 20–22 mm latis, brevissime stipitatis, articulatis, basi cuneatis, acuminatis, crenulatis, coriaceis, glabris, siccis supra atroviridibus, infra olivaceis; pinnis fertilibus 20 cm longis, 2 mm latis, stipitibus earum 5 mm longis, validis.

No. 285.
Nearest to *L. recurvata* Fée Mém. 2: pl. 28, but with longer and much stouter stalks of the fertile pinnae and without the peculiar episporium. Of species in the same part of the world, *S. Brackenridgii* (Carr.) Underw. has sterile pinnae abruptly narrowed to long stalks, and *S. Novae-Caledoniae* (Mett.) Underw. has broad fertile pinnae and sterile pinnae stalked and not acuminate.

ARTHROPTERIS J. Smith.

1. **A. Kingii** Copel. spec. nova.

Rhizomate repente, 1 mm crasso, nigro, paleis deciduis; stipitibus remotis, 3–5 cm altis, nigris, ca. 2 cm supra rhizoma articulatis; fronde 12–20 cm alta, 40–45 mm lata, acuminata, deorsum vix angustata; rhachi nigra, brevissime cinereo-puberula; pinnis horizontalibus, sessilibus, articulatis, subacutis, acroscopice auriculatis, siccis nigrescentibus; indusiis aliquantum persistentibus.

No. 332, Lakekamu.
Very distinct from other species of the genus, in the articulation hardly below the middle of the stipe. *Dryopteris orientalis* is like it in this respect.

NEPHROLEPIS Schott.

1. **N. biserrata** (Swtz.) Schott.
Nos. 125, 162, Ambasi. No. 162 has the sori very near the margin.
Widespread.

2. **N. cordifolia** (L.) Presl.
No. 224, Goodenough Bay, altitude 900 m.
Widespread.

3. **N. acuminata** (Houtt.) Kuhn.
No. 223, Goodenough Bay, altitude 900 m.
Malaya.

A rather shallowly lobed form. The indusia are frequently peltate; but the form is inconstant, and peltate ones are occasionally found on Bornean specimens. New to New Guinea.

OLEANDRA Cavanilles.

O. neriiformis Cav.
No. 192, Camusi River flats; *No. 343*, Lakekamu.
Almost pantropic.

As the specimens are fallen fronds the identification is not quite positive.

HUMATA Cavanilles.

1. **H.** sp.
No. 326, Lakekamu.

2. **H. gaimardiana** (Gaud.) J. Sm.
No. 165, common on the coast.
Polynesia to Burma.

3. **H. heterophylla** (Sm.) Desv.
No. 111, Waria River, altitude 300 m; *No. 201*, Camusi River flats.
Malaya, Polynesia.

DAVALLIA Smith.

1. **Davallia papuana** Copel. spec. nova.

Stipite 30 cm alto, basi paleis angustis 4 mm longis ferrugineis vestito, aliter rhachique glabris, brunneis; fronde 45 cm alta, deltoidea, fere quadripinnata; pinnis infimis fere 30 cm longis, deltoideis, acuminatis, rhachibus sursum anguste alatis; pinnulis ovatis, obtusis; segmentis earum majoribus incisis, lobis vel dentibus plus minus cornutis, lamina glabra, coriacea; venis spuriis intercalatis; soro inframarginale; indusio 1 mm longo, aequilato vel angustiore, limbo plerumque rotundato, interdum obtuse et late cuspidato et reflexo.

No. 245.

Well marked among the species with false veins by the position of the sorus, combining then the characters of *D. denticulata* and *D. divaricata*.

SCYPHULARIA Fée.

1. **S. pentaphylla** (Bl.) Fée.
No. 188, Goodenough Bay, altitude 1,200 m.
Malaya to Polynesia.

This is better known as *Davallia pentaphylla* Bl., but it seems to me advisable to recognize Fée's genus as distinct.

ODONTOSORIA (Presl) Fée.

1. **O. decipiens** Cesati.
No. 184, Goodenough Bay, altitude 1,200 m.
New Guinea.

This plant seems to me too near to the widespread *O. chinensis*; but I have the judgment of Christ (Rés. Exp. Néerland. 8 (1910) 168) to follow in maintaining it as distinct.

2. **O. retusa** (Cav.) J. Sm.
No. 170, Ambasi, a rather narrow form.
Malaya to Melanesia.

DENNSTAEDTIA Bernhardi.

1. **Dennstaedtia** sp., perhaps *Dicksonia delicata* F. Müller.
No. 244.

This is near to but not identical with *D. samoensis* (Brack.) Moore.

MICROLEPIA Presl.

1. **M. Speluncae** (L.) Moore.
Nos. 174, 255.

Neither of these is typical, and they are unlike, but they fall within the extremes of *M. Speluncae* as commonly construed.

TAPEINIDIUM (Presl) Christensen.

1. **T. marginale** Copel. spec. nova.

Stipite 50 cm alto, rhachique supra nigris; fronde fere 60 cm alta; pinnis maximis 25 cm longis, 1 cm latis, herbaceis, serratis dentibus truncatis; soris ad apices plurium venarum, latis non altis, strictissime marginalibus.

No. 283.

A very large relative of *T. pinnatum*, with strictly marginal sori, usually about 2 mm wide and hardly 0.5 mm deep, evident when the frond is seen from above. The margin of the frond is slightly modified. The rachis and upper end of the stipe are square.

2. **Tapeinidium** sp.
No. 261.

This is distinct from any species known to me, but I suspect that it may be *Davallia longipinnula* Cesati.

LINDSAYA Dryander.

1. **Lindsaya sessilis** Copel. species nova.

Odontoloma gregis L. repentis, stipitibus vix 2 mm longis et indusiis fugacibus facile distinguendu; rhizomate paleaceo repente; fronde 20 cm vel paullo ultra alta, 4–4.5 cm lata, abrupte acuminata, pinnis utroque latere ca. 35, infimis reductis, medialibus recurvis vel paullo deflexis, basi cuneatis, superne inciso-crenatis; soro apice lobi remoto, parvo, indusio minuto transeunte.

No. 244.

2. **Lindsaya brevipes** Copel. species nova.

Species L. concinnae J. Sm. affinis, stipitibus brevibus et frondibus deorsum sensim angustatis distinguenda; stipitibus confertis, ca. 1 cm altis; frondibus 20–30 cm altis, 15 mm latis, pinnis deorsum in rudimenta 1–2 mm longa, integra vel fissa haud remota diminutis, medialibus ut L. concinnae, soris inframarginalibus, venis 1–5 insidentibus.

No. 237, type; *No. 266.*

Lindsaya gracilis Bl. has a wide-creeping rhizome with the fronds far apart and the pinnae lobed.

3. **Lindsaya microstegia** Copel. species nova.

Rhizomate repente, 1.5 mm crasso; stipitibus inter se ca. 15 mm distantibus, frondium bipinnatarum ca. 12 cm altis; fronde normale bipinnata, ca. 30 cm alta, 20–25 cm lata; pinnis utroque latere 2 vel 3, subsessilibus, 15–18 cm longis, 25 mm latis, acutis; pinnulis utroque latere ca. 30, brevistipitatis, basi cuneatis, apice rotundatis, margine inferiore integro plerumque recurvo, superiore crenulato; soris a margine remotis, parvis, pinnulae quaeque ca. 10, ad venulas 1–2 insidentibus, indusio pallido, vix 0.2 mm longo, 0.5–1.0 mm lato, mox sporangiis occulto.

No. 242.

This species suggests *L. Natunae* Baker, but is very distinct in the position of the sorus.

4. **Lindsaya Kingii** Copel. species nova.

Eulindsaya, rhizomate repente, 3 mm crasso; stipitibus proximis, 25–30 cm altis, brunneis, deorsum ob baseos palearum aspera, tota planta aliter glabra; fronde 45–70 cm alta, 25–30 cm lata, bipinnata, rhachi quadrangulare sulcata; pinnis utroque latere 10–15, infimis valde diminutis, superioribus vix abbreviatis, medialibus usque ad 18 cm longis, 15 mm latis, subsessilibus, acuminatis; pinnulis utroque latere 30–40, brevistipitatis, dimidiatis, ca. 8 mm longis, 3–4 mm latis, superne inciso-crenatis; soro in lobo quoque uno, inframarginale, plerumque ad venulas 2 insidente, indusio breve et lato, pallide brunneo.

No. 241 (type), *280.*

In appearance, *L. Francii* Rosenst. in Fedde's Repert. 9 (1910) 73, must be very like this except as to the lower pinnae, but its sori put it into *Odontoloma.*

5. **Lindsaya trichophylla** Copel. species nova.

Rhizomate erecto; stipitibus confertis, tenuibus, ca. 2 cm altis; frondibus (plantae meae) 5–8 cm altis, ca. 1 cm latis, utrinque angustatis, glabris, rhachi sulcata; pinnis stipitatis, dimidiatis, ad costam anguste alatam in segmenta pauca, divaricata, 0.2 mm lata dissectis,

capitibus segmentorum abrupte dilatatis, 0.5–0.8 mm latis, integris, indusio lato, apici aequante.

No. 262.

Like a very small *L. blumeana* (Hook.) Kuhn, but the segments fewer and spreading, with more dilated and entire tips, and the indusium equalling the segment. *L. exilis* Fourn. must also have similar juvenile forms.

6. **L. tenuifolia** Bl.
Nos. 238, 264.
Malaya, Polynesia.
The indusia are wide and not deep.

SCHIZOLOMA Gaudichaud.

1. **S. ensifolium** (Sw.) J. Sm.
No. 178, in grassland.
Polynesia to Africa.

SYNGRAMMA J. Smith.

1. **S. Hookeri** C. Chr.
No. 365, Lakekamu.
Fiji, New Guinea, Borneo.

Hooker's figure, (Second Century, *Pl. 55*) represents a frond with much stouter stipe than this has; and his frond is twice as broad in proportion to length as are these fertile fronds. Mr. King's specimen has 3 fertile and 3 sterile fronds, all close together on one rhizome. The sterile fronds are about 20 cm long by 4–5.5 cm wide, on stipes 16 cm high; the fertile are up to 25 cm long without their tips, by about 3 cm wide, on stipes 26 cm high. The rhizome has the generic characters, and is 4 mm thick.

2. **S. pinnata** J. Sm.
Nos. 118, 298, Ambasi.
To Fiji and northern Australia.

The specimens are rather small, and the lowest pinnae therefore very short-stalked. The costal areoles are smaller than in Smith's cut. The margin is cartilaginous, and undulate or deflexed. In either of these cases it is impossible for water to pass from the upper to the nether surface.

CRASPEDODICTYUM Copeland genus novum.

Gymnogramme frondibus ternatis vel palmatis, venis apud marginem reticulum (qua conditione nomen) efformantibus, infra eam reticulum liberis et rectis et soros continuos ferentibus, paraphysibus nullis.

1. **C. grande** Copel. spec. nova.

Stipite fere 60 cm alto, 8 mm crasso, fusco-stramineo, supra pedem nigrum glabro; fronde ternata; parte mediana maxima, 40 cm alta, ca. 8 cm lata, brevi-stipitata; frondulis lateralibus ca. 25 cm longis, adnatis, sensim acuminatis; seriebus areolarum marginalium duabus.

No. 117, Ambasi.

2. **C. quinatum** (Hook.) comb. nova.
Gymnogramme quinata Hooker Sp. Fil. 5 (1864) 152, *Tab. CCXVII.*
No. 262, Ambasi.
Reported from the Solomon Islands to Sumatra.

This differs from the preceding species in having a hispid, chestnut stipe, in being smaller throughout, with the leaflets thinner and abruptly contracted below the apex, and the margin subtended by a single row of areolae.

The genus is between *Syngramma* and *Coniogramme* in its characters. In the form of the frond it differs from either. In essentials, it also differs from *Coniogramme* in venation and from *Syngramma* in the absence of filamentous paraphyses.

HYPOLEPIS Bernhardi.

1. **Hypolepis** sp.
No. 168.
The specimen is imperfect, but does not represent any Malayan species.

PTERIDIUM Gleditsch.

1. **P. aquilinum** (L.) Kuhn.
No. 299, Ambasi.
Cosmopolitan.
Pteridium belongs with *Paesia* among the derivatives of *Dennstaedtia*.

HISTIOPTERIS (Agardh) J. Smith.

1. **H. incisa** (Thunb.) J. Sm.
No. 229, Goodenough Bay, altitude 1,200 m. In grass.
Pantropic and subtropical.

PTERIS Linnaeus.

1. **P. longifolia** L.
No. 213. C. Vogel.
Almost cosmopolitan.

2. **P. moluccana** Bl.
No. 124, Ambasi.
Malaya to the Solomon Islands.

3. **P. deltoidea** spec. nova.

Pteris P. creticae affinis, forma deltoidea; pinnis infimis tripartitis, pinnula inferiore pinnata pinnulis ^{II} quattuor, pinnulis terminale et superiore ad basin fissis; pinnis lateralibus utroque latere una fissa et 1 (vel 2) simplice; pinnis vel pinnulis ultimis omnibus linearibus 5–18 cm longis, 8 mm latis, ubi sterilibus acute non grosse serratis; soris medialibus.

No. 242, Ambasi.
An obvious relative of *P. cretica*, but the relative development of the lowest pinnae too great to permit its reference to that polymorphous species. The stipes are stramineous below, light-brown above.

4. **P. ensiformis** Burm.
No. 243.
Polynesia to India.

5. **P. beccariana** C. Chr.
No. 233, Ambasi.
New Guinea.

6. **P. quadriaurita** Retz.
No. 154, Ambasi.
Pantropic.
P. biaurita, or the plant I call such, is distinct.

7. **P. tripartita** Swtz.
No. 156, Ambasi.
Polynesia to Africa.

CHEILANTHES Swartz.

1. **C. tenuifolia** (Burm.) Swtz.
No. 290, Ambasi.
New Zealand to India.

NOTHOLAENA R. Brown.

1. **N. hirsuta** (Poir.) Desv.
No. 289, Ambasi.
Polynesia to India.

DORYOPTERIS J. Smith.

1. **Doryopteris papuana** Copel. spec. nova.

D. grandis, stipite valido 40 cm alto; fronde fere 20 cm alta et lata, costis lamina 5 mm et ultra lata marginatis; segmentis infimis maximis, 15 cm longis, basiscopice pinnatifidis et segmentis $^{\text{II}}$ basiscopice segmentis $^{\text{III}}$ duobus ornatis, segmentis partis medialis utroque latere ca. 4, segmentis ultimis omnibus lanceolatis valde acuminatis; venulis anastomosantibus; fronde sterile non visa.

No. 208, Goodenough Bay, on dry banks of creeks.

This species is considerably more dissected than *D. ludens* ever is. It is very near the American *D. pedata* (L.), but larger and less coriaceous than any of my specimens of that variable fern; and I have never seen *D. pedata* with the basal segments so much cut on the lower side while the upper remained entire.

The genus is new to New Guinea, the nearest occurrence hitherto known being in Hawaii, South America, and the Philippines.

ONYCHIUM Kaulfuss.

1. **O. tenue** Christ.
No. 209, Bartle Bay, *No. 333*, Port Moresby.
New Guinea, Java, the Philippines.

ADIANTUM Linnaeus.

1. **A. philippense** L.
No. 211, C. Vogal.
Almost pantropic.

TAENITIS Willdenow.

1. **T. blechnoides** (Willd.) Swtz.
No. 153, Ambasi.
Fiji to India.

VITTARIA J. E. Smith.

1. **Vittaria scabricoma** Copel. spec. nova.

Taeniopsis, paleis rhizomatis vix 5 mm longis, angustissimis, basi dilatatis, rigidis, sparse denticulatis, nigris; frondibus approximatis, sessilibus, 20–25 cm longis, 4 mm latis, utrinque angustatis, acuminatis, glabris, coriaceis; costa manifesta haud prominente; soris submarginalibus, sporangiastris claviformibus, obscuris; sporis reniformibus.

No. 166.

A species of the *V. lineata* group, which as commonly construed contains a number of distinct Malayan species, none of which probably belong to it as a species. The paleae are very harsh, having exceptionally thick cell-walls.

2. **V. scolopendrina** (Bory) Thwaites.
No. 244, Ambasi.
Samoa to Africa.

3. **V. zosterifolia** Willd.
Nos. 199, 200, Goodenough Bay, altitude 1,200 m.
Polynesia to the Comores.
No. 129 is exceptionally broad and long stalked, and may be distinct.

4. **V. elongata** Swtz.
No. 187, Goodenough Bay.
India to Polynesia.

ANTROPHYUM Kaulfuss.

1. **A. reticulatum** (Forst.) Kaulf.
No. 316, Ambasi, a decidedly long-stipitate form.
Polynesia to Madagascar.

2. **A. plantagineum** (Cav.) Kaulf.
Nos. 198, 234, Ambasi.
Polynesia to India.

3. **A. semicostatum** Bl.
No. 330, Lakekamu.
Polynesia to Ceylon.

LOXOGRAMME (Blume) Presl.

1. **Loxogramme paltonioides** Copel. spec. nova.

Species L. lanceolatae Presl similis et affinis, soro composito utroque latere uno intramarginale costae parallelo, ad partem superiorem frondis paullum angustatam restricto.

No. 253; *No. 217* is probably a juvenile form of the same; the sori are not quite continuous, and in one place overlap slightly. The question raises itself, if *Paltonium chinense* (Christ) C. Chr. may not be a *Loxogramme*.

2. **L. involuta** (Don) Presl.
No. 297, Ambasi.
Melanesia to Malaya and China.
A very large form, but otherwise typical.

PROSAPTIA Presl.

1. **P. contigua** (Forst.) Pr.
No. 345, Lakekamu.
Malaya, Polynesia.

POLYPODIUM Linnaeus.

§ EUPOLYPODIUM.

1. **P. decorum** Brack.
No. 113, Waria River, German New Guinea, altitude 900 m.
Polynesia to Ceylon.

This is more slender than most specimens and is not quite pinnate. It has been determined by Bailey as *P. blechnoides* (Grev.) Hook, which would be the name to maintain if the species were identical. But the latter as described is much broader; and the hairs around the sori could hardly have been overlooked in the preparation of Greville's figures. The sinuses between segments are closed to water by a few very peculiar branched hairs, as in the *P. decorum* of the Philippines.

§ GONIOPHLEBIUM.

2. **P. verrucosum** Wall.
Nos. 240, 240A. No. 240 is a very large form, the fronds reaching a length of almost three meters.
Australia to the Philippines.

§ PHYMATODES.

3. **P. senescens** Copel. spec. nova.

P. (Crypsinus) rhizomate repente paleis pallide ferrugineis mox albescentibus late lanceolatis integris vestito; stipitibus inter se ca. 1 cm distantibus, frondis sterilis 1–1.5 cm altis, frondis fertilis 3–5 cm altis, glabris, nitidis, tenuibus sed rigidis; fronde sterile elliptico-orbiculare, 10 mm lata, basi late cuneata, minutissime et remote incisa, glabra, dura et opaca, margine revoluta; fronde fertile lineare utrinque angustata, vix 5 mm lata, sensim integra, coriacea; soris utroque latere uniseriatis, medialibus, inter se remotis, parvis, leviter immersis.

No. 274.
Related to *P. pyrolifolium* Goldm., *P. neglectum* Bl., and *P. oodes* Kze.

4. **P. accedens** Bl.
No. 252, Ambasi.
Malaya and Polynesia.
An adhuc P. damunense Rosenstock ?

5. **P. rupestre** Bl. var. **leucolepis** Rst.
No. 218, Ambasi.
The species Malayan, the variety Papuan.

6. **P. punctatum** (L.) Swtz.
Nos. 119, 256, Ambasi. The former is acute, the latter subcordate at the base.
Polynesia to Africa.

7. **P. neo-guineense** Copel. spec. nova.

Species P. membranaceo Don et P. punctato Swtz. affinis, frondibus 40–50 cm longis, 5–6 cm latis, sessilibus, anguste oblanceolatis, utrinque sensim angustatis, caudatis, integris, membranaceis, translucentibus; venis lateralibus usque ad marginem protensis, obliquis, venis secundariis costae parallelis; areolis haud parvis; soris minutis, superficialibus, irregulariter adspersis.

No. 335, Lakekamu.

This species differs from *P. membranaceum* in the irregularly scattered sori, from *P. punctatum* in the extreme thinness, and from both in the very acute angle between costa and main veins.

8. **P. glossipes** Baker.

Nos. 173, 311, Ambasi.

New Guinea; Cambodia, fide Christensen's Index.

The rhizome of *No. 311* is densely scaly, but that of *No. 173* more sparsely so. The fronds are acuminate.

9. **P. Phymatodes** L.

Nos. 176, 241, Ambasi.

Polynesia to Africa.

No. 176 has the usual pinnate form, but the sori are up to 5 mm wide.

No. 241 is determined by Bailey as *P. subgeminatum* Christ, correctly as far as the inadequate diagnosis definitely shows. The rhizome is stout and ivory-white; the dwarf-branches bear 1 to 3 fronds, most often, 2; the stipes are 1 to 3 cm long, and slender. The fronds are lanceolate, about 10 cm long, simple and entire; the upper surface densely covered with lime-dots; the sori in a single row. Each of these peculiarities, even the geminate fronds, is occasionally met in *P. Phymatodes*. This might be specifically distinguished by the group of characters, but I have preferred to leave it where it clearly has a very close affinity.

10. **Polypodium Kingii** Copel. spec. nova.

Rhizomate scandente, 2–3 mm crasso, paleis nigris peltatis marginibus angustis laete brunneis adpressis obtecto; stipite articulato, ca. 6 cm alto, ad pedem paleis minutis paucis vestito, aliter glabro; fronde glaberrima, ca. 15 cm alta et lata, basi vix brevissime cuneata, in specimine meo profunde quinquelobata, sinubus rotundatis, segmentis integris valde acuminatis, terminale late, lateralibus angustius lanceolatis, papyraceo-coriaceis; venis nigris, conspicuis, seriem unam vel in segmento terminale duas areolarum praestantium efformantibus, haud ad marginem protensis, venulis occultis, plerumque hamatis; soris ultra 1.5 mm latis, globosis, superficialibus.

No. 122; No. 366, from Samarai, may be the same, but is sterile and old.

Superficially, this species is very similar to *P. pteropus* Bl., in spite of the fact that the base is hardly decurrent. However, in spite this time of the superficial sori, I believe that it is a nearer relative of *P. nigrescens*. The sterile frond, the collector writes, is simple, and borne lower down on the tree than the fertile.

11. **Polypodium (Phymatodes) multijugatum** Copel. spec. nova.

Rhizomate inviso, teste King inter gramina terrestre; stipite 40 cm alto, 4 mm crasso, stramineo-castaneo, glabro; fronde ca. 60 cm alta, 25 cm lata, pinnatifido-pinnata; segmentis infimis liberis (i. e. pinnis) ad basin dilatatis, ad stipitem non decurrentibus, sequentibus ala angusta connexis, 10–15 mm latis, usque ad 15 cm longis, acuminatis, integris vel leviter sinuatis, chartaceis, glabris; venis sat conspicuis, haud rectis, anastomosantibus, venulis occultis; soris plerumque utroque biseriatis, in areolis majoribus solitariis, superficialibus, 2–3 mm latis, globosis.

No. 228, Goodenough Bay, altitude 900 m.

A relative of *P. Phymatodes*, and conceivably identical with Christ's variety *multisectum*.

12. **P. pteropus** Bl.
No. 276, Ambasi.
Malaya, southern Asia.

The fronds are small and simple, though fertile. It is possible that this is a small form of *P. aquaticum* Christ, described from German New Guinea.

13. **Polypodium papyraceum** Copel. spec. nova.

Rhizomate ignoto; stipite 15 cm alto, brunneo, glabro, prope laminam anguste alato; lamina 22 cm alta, 12 cm lata, vix ad costam pinnata; segmentis utroque latere 7, adscendentibus, majoribus 11 cm longis, 8 mm latis, inferioribus utrinque angustatis, basibus dilatatis et ala angusta connexis, integris vel subsinuatis, glabris, papyraceis; venis rectis vel conspicuis carentibus; apud costulam serie una areolarum angustarum plerumque longarum, trans cujus areolam quamque areolis duabus majoribus, inter quas soro solitario fere superficiale globoso parvo; venulis inclusis liberis saepius hamatis.

No. 115, in lowlands.

This species presents the form of a slender *P. ellipticum*, but in venation is comparable rather with *P. nigrescens*. *P. Moseleyi* is much thicker, and has salient main veins. *P. Billardieri* is a large, coriaceous relative of *P. Phymatodes*.

14. **P. albicaulum** Copel. spec. nova.

Selliguea rhizomate albo-calcareo, paleis ejusdem sparsis, acicularibus, castaneis, 5 mm longis, squarrosis, basibus peltatis albomarginatis; stipitibus tenuibus, frondibus sterilibus late lanceolatis, 10–15 cm longis, valde acuminatis, coriaceis; frondibus fertilibus anguste lanceolatis, soris superficialibus.

No. 327, Lakekamu (type); *No. 263*.

Very like *P. caudiforme* Bl. in most respects, but easily distinguished by the clothing of the rhizome.

15. **P. sinuosum** Wall.
No. 270, Ambasi.
Melanesia to Malacca.

16. **P. musaefolium** Bl.
Nos. 148, 190, Ambasi.
New Guinea and Malaya.
The species is wonderfully rich in forms.

DENDROCONCHE Copeland genus novum.

Genus a Polypodio ob frondes non ad rhizoma articulatas, dimorphas, steriles ut Drynariae humiferas, integras separandum; frondis fertilis parte inferiore sterile, oblata, parte superiore valde elongata, lineare; venulis anastomosantibus. Nomen ex δένδρον, arbor, et κόγχη, concha in formam frondium sterilium illudens.

1. **D. Annabellae** (Forbes) Copel. comb. nova.
Polypodium Annabellae Forbes in Journ. of Bot. 26 (1888) 33.
This plant is without any reasonable doubt descended from *Polypodium musaefolium* Bl., or some form very close to it; it is generically to be separated because aberrant in such important details that its inclusion in *Polypodium* would be decidedly too inconvenient. *Drynaria* has the same ancestry; but *Drynaria* and *Dendroconche* represent distinct lines of development, and therefore are not to be united, unless with the parent.
An excellent illustration accompanies the original publication of the species.

CYCLOPHORUS Desvaux.

1. **C. adnascens** (Sw.) Desv.
No. 197, Ambasi, common.
Polynesia to India.

2. **C. stigmosus** (Sw.) Desv.
No. 116, Waria River, altitude 300–600 m; *No. 249*, Ambasi.
Malaya, India.

3. **C. Lauterbachii** (Christ) C. Chr.
No. 346, Lakekamu.
Known only in New Guinea.
The sterile fronds are broader toward the base than is typical; and the sori are not close enough to the margin to be visible from the upper surface. The midrib is visible above and below.

DRYNARIA (Bory) J. Smith.

1. **D. sparsisora** (Desv.) Moore.
Nos. 207, 231, 242, common.
Fiji and tropical Australia to Ceylon.

2. **D. quercifolia** (L.) J. Sm.
No. 327, Ambasi.
Same range as the last.
The segments are connected by a broader wing than are those of the specimens sent, of *D. sparsisora*.

3. **D. rigidula** (Sw.) Bedd.
Nos. 127, 225, 296, at moderate altitudes.
Same range as the preceding.

MERINTHOSORUS Copeland genus novum.

Genus gregis Drynariae, fronde deorsum sterile segmentis more D. quercifoliae deciduis, sursum fertile pinnata, pinnis angustissimis, soro utroque latere uno. Nomen ex *μήρινθος*, linea, et *σωρός*. Type, *King No. 288*.

M. drynarioides (Hooker) Copel. comb. nova.
Acrostichum drynarioides Hooker, Species Filicum 5 (1864) 282.

This plant seems to have been placed in a different genus about as often as it has been collected. By definition, never a very satisfactory reason for putting a plant in a group, it fits best in *Photinopteris;* but it is more nearly related to *Dryostachyum*. From the latter, and from the still more similar *Aglaomorpha*, it is sharply distinguished by the very long, uninterrupted sori.

I have named King's plant as type of the genus, because I am not perfectly certain of the nature of the type of the species. The Papuan plant is identical with that of the Solomon Islands, cited in the original description; but the Penang plant, which receives first mention, is known to me only by description and illustration, and these seem not to agree perfectly with the specimens from farther east.

LECANOPTERIS Blume.

1. **L. pumila** Bl.
No. 105, Waria River, above 300 m.
Java, the Philippines. The genus is new to New Guinea.

ELAPHOGLOSSUM Schott.

E. conforme (Sw.) Schott. (?)
No. 212, Goodenough Bay, alt. 1,300 m.

The specimen sent is a fertile and a sterile frond, both old and without rhizome, and can not be determined positively. It does not agree with the description of *E. sordidum* just published by Christ, the first plant in the genus known from New Guinea.

E. conforme in various forms is pantropic.

ACROSTICHUM L.

A. aureum L.
No. 204, common along the coast.
Pantropic.

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PHILIPPINE HATS.[1]

By C. B. ROBINSON.

(From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.)

INTRODUCTION.

Hats have been made in the Philippines since before the coming of Europeans, and have been a regular article of export for at least seventy years, the annual number sent from the Islands now averaging over half a million, the total annual output probably exceeding two million.

They may roughly be divided into three classes, soft hats of the general style of the Panamas, straw hats with flat brims and crowns made from imported materials, or of similar shape but of native materials, and hard hats more often circular in outline but of various shapes. Of these, the first class is commercially the most important, and is the one chiefly dealt with in this paper; the second is a comparatively recent development, but supplies a large part of the local trade; the third is prehistoric in origin, useful, but at least gradually disappearing, and of greater ethnologic than commercial interest.

Many materials are used, especially for the last class, but the great majority of hats of the first class are made from two species of plants, the buri palm (*Corypha elata* Roxb.), and the spiny bamboo (*Bambusa blumeana* Schult. f.). A species of pandan, usually assumed to be *Pandanus sabotan* Blanco, and a rattan (*Calamus mollis* Blanco), furnish materials in many ways of even greater excellence, but the output is much smaller. Species of *Lygodium*, climbing ferns, known locally as *nito*, formerly ranked among the chief materials but are now less used. Two other materials, *Pandanus utilissimus* Elmer, and a sedge, *Fimbristylis utilis* Elmer, are of local importance, but for cheap hats only.

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[1] After the original text of this manuscript had been completed, a paper on the same subject was published by Mr. Hugo H. Miller, as Bulletin 33 of the Bureau of Education. As many aspects of the subject are very fully and accurately treated by him, the present paper has been rewritten with the excision of a large quantity of matter to avoid duplication: such data herein as are due to that publication being credited in footnotes.

There is every variation in quality. Prices range from 6 centavos to perhaps 1,000 pesos per hat.[2] The main basis of price is the time required in making the hat; the excellence of materials or the difficulty of procuring them are also factors in some cases. Shapes usually follow standard lines, although the workers will vary them to suit changing styles, but with considerable conservatism.

Hats of the first and third classes are practically all made by women and girls in their own homes, men rarely doing more than to gather the materials and perform the rougher part of the preparation, and to do the actual selling at prices the minima of which have been fixed by their wives.

SEAT OF THE INDUSTRY.

Hats of one grade or another are made at a great many places but three towns have deservedly the widest reputation, Baliuag in Bulacan, Lucban in Tayabas, and Calasiao in Pangasinan. In the case of the two first, neighboring towns share in the work, notably Pulilan in Bulacan and Apalit in Pampanga, both near Baliuag; and Majaijai and Luisiana in Laguna, and Sampaloc and Mauban in Tayabas, all four near Lucban. Naturally, when a woman moves from any of these places, a potential hat industry is set up in her new home, and in occasional cases this has become of more or less importance, but more often they make no further effort than to supply the needs of their families. Another locality well worthy of mention is Mavitac in Laguna, from which the work has spread to several places in the neighborhood, especially to Pililla in Rizal. Albay and Ambos Camarines were among the first provinces to engage in this industry, but have not retained their comparative position, and are now of much less importance in this respect than those above named. Ilocos Norte also has a small trade.

All of these are upon the Island of Luzon. In the Visayas, the industry reaches importance upon the Island of Panay, especially in the towns of Pototan and Dumarao; the other island chiefly concerned is Bohol.

Everywhere, hat making is accompanied to a greater or less extent by the weaving of mats, and less often of bags, baskets, and cigarette-cases. Many places have a wider trade in mats than in hats, still more make mats but not hats, at least on a commercial scale. This is especially true of Basey in Samar, and of Romblon, with a great reputation for mats; the "Romblon" hats are made on the adjoining Island of Sibuyan.

In pursuance of the policy of the Bureau of Education, the work is being taught at many places, and through this, already has reached the commercial stage in some towns where previously it did not exist. It is probable that in the course of a few years, their number will greatly be increased.

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[2] One peso of 100 centavos Philippine currency equals 50 cents United States currency, and slightly more than 2 shillings, 2 francs 73 centimes, or 2 marks 10 pfennige.

HISTORY.

From a variety of sources, it has been possible to obtain considerable light upon the history of hat making in the Philippines. The earliest data have chiefly been taken from the translations by Blair and Robertson[3] of documents, whose originals have in most cases not been available for consultation. The references here cited are to the translations.

The story goes back at least to the date of the first visit of Europeans to the Islands. In Pigafetta's narrative of the Magellan expedition, he writes the following regarding their stay at Cebu, in 1521.[4] The queen "wore a large hat of palm leaves (in the manner of a parasol), with a crown about it of the same leaves, like the tiara of the pope (and she never goes any place without such a one)." Later, in a description of the queen going in state to mass, he says: "Three girls preceded her with three of her hats in their hands * * * and she had on her hat." But the women in the procession had no further covering for the head than a small scarf. On a subsequent call by Pigafetta, he found the queen weaving a mat.[5] The description of the king's costume[6] shows that he did not wear a hat, so that in the beginning, the hat habit in the Philippines was feminine, although today it is definitely the opposite.

Mat making can be traced still further. Chao Ju-Kua's description of the Philippines,[7] the exact date of which is not known, but almost certainly before 1300, notes the Philippine traders as selling fine mats, although they imported a kind of basket woven from rattan.

Although the hats of Cebu were indexed as having been made from the coconut palm, it is much more likely that they were of buri or some species of *Livistona*. Indeed, these two genera of palms, the latter especially, suggest a possible theory of the origin of hats in this part of the world. The leaves of *Livistona* are not unlike a flattened umbrella, the petiole corresponding to the handle, the numerous midribs to the ribs, and the lamina, which is continuous nearly to the margin, supplies the covering. To this day, these leaves are frequently used as a shelter, and make an excellent substitute for an umbrella or parasol. It would have been an easy advance to have attached a light framework, and thus made a permanent hat. As a matter of fact, the third type of hats indicated above, known in most dialects as *salacots*, are often now made in exactly this way. The origin of our other classes of hats is undoubtedly due to Spanish influence.

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[3] Blair, E. H. & Robertson, J. A. The Philippine Islands. 55 vols. 1903–1909.

[4] B. & R. 33: 159, 161. The clauses here put in parentheses are not found in all manuscripts.

[5] B. & R. 33: 205.

[6] B. & R. 33: 147.

[7] B. & R. 34: 189.

Magellan presented the king of Cebu with a velvet cap, and caps of this type were subsequently imported. In 1565, for example, three dozen were requisitioned from Nueva España, for barter at Cebu.[8] By that year, the wearing of other hats must already have been on the increase. This seems to be so, because during Legaspi's visit to Cebu, most of the women in a procession "wore palm-leaf hats."[9]

By 1609, we have the statement, with an implied backward reference, "since the Spaniards came to the country many Indians * * * wear * * * hats."[10] Colin, in 1663, while giving a comparative account of conditions before their coming and as they were in his day, says:[11] "the men adorned the head with only cendal or long and narrow thin cloth * * * now * * * the men wear hats."

Even at an early date, some at least of the hats were highly esteemed, and probably of considerable value. As evidence of this, there may be cited the following passage, taken from the account of a Spanish embassy, sent from the Philippines to Japan, in 1593–1597.[12] "His intention is to take a certain rich present with him in order that he may say in Japan that he brings recognition. * * * He says also that when Don Agustin, a Tagal of Tondo, and Don Baltazar, a Japanese, conspired together to seize Manila, Don Agustin gave the latter a hat."

The following passage occurs in San Agustin's account of the native peoples and their customs,[13] 1738–1744. "In olden times the men wore their heads covered or wrapped about with a narrow strip of cotton or linen. * * * Now they wear neat white and black hats, which are woven from various materials which they gather in the field." He and Velarde are elsewhere more definite. "From palm leaves, rattan, and *nito*, they make hats, and *petates* or rugs, which are very handsome, and wrought with various kinds of flowers or figures." At Caragha, now Caraga, in northern Mindanao, in 1662, the women were said[14] to "use curiously woven hats of palm leaves," and the hats, or rather *salacots*, of that locality are even to-day as "curious" as those of any locality in the Islands, although the main material is bamboo and it is a distinct stretching of the meaning of the word to call them woven.

Mercado was a mestizo priest, who spent his entire life in the provinces near Manila, dying in 1698. He investigated, after the fashion of the time, the medical and other plants of the country, but his manuscript remained unpublished for about two centuries. He says of *nito* (*Lygodium*),[15] "Sirven para hacer petaquillas para el buyo y otras curiosidades, como sombreros."

Viana, in 1765, advocating a change in the route of ships from the Philippines, writes:[16] "The said ships * * * could carry some products of the islands * * * such as very fine *petates* or mats, hats of the same kind and cotton." There may therefore have been by that time a considerable manufacture of hats and mats in the Archipelago; at the least, the work done must have been of such a nature that he believed it possible to build up an extensive export trade. Yet he says elsewhere that hats were being imported at high prices.

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[8] B. & R. 2: 191.

[9] B. & R. 2: 140.

[10] B. & R. 16: 77.

[11] B. & R. 40: 61, 63.

[12] B. & R. 9: 48, 49.

[13] B. & R. 40: 285, 291.

[14] B. & R. 21: 202.

[15] Blanco Flora de Filipinas ed. 3, 4 (1880) 50.

[16] B. & R. 48: 279.

Cavanilles[17] gives the first scientific data on the subject. "In Luzoniensis insulae provincia Camarines, quae Nova Cazeres etiam dicitur, oppidum exstitit Nabúa nomine, cuius incolae diversa perficiunt texta ex huius plantae caulibus, et praesertim galeros, nunc proprio caulium colore nunc aliis variegatos. Mundant primo caules, quos longitudinaliter in laminas sectos adeo lente textoriae arti parant, ut mensem fere integrum unusquisque textor galero unico conficiendo consumat. Ludovicus Née."[18]

Née arrived in the Philippines as one of the botanists of the Malaspina expedition, on March 27, 1792. Although he was a botanist of high repute, his name is not even mentioned in Presl's "Reliquiae Haenkeanae," which gives a long account of the wanderings of another botanist of the party, probably because of some petty national jealousy. Attempts to construct an itinerary for him from the references in Cavanilles lead to confusion, but it is probable that his observations were made about February, 1793. The species, concerning which the above statements were made, was *Ugena semihastata* Cav., now known as *Lygodium semihastatum* (Cav.) Desv.

Blanco,[19] referred to Cavanilles' note, and stated that hats were made of this and two other species of *Lygodium*, one called by him *Ugena alba* being probably *L. circinnatum* (Burm.) Sw., the other, left unnamed, is probably *L. japonicum* (Thunb.) Sw. According to Blanco, the best hats were those made from *L. semihastatum*. At present, when *nito* has become a minor material, at least the only species the use of which has been proven with certainty is *Lygodium circinnatum*.

It is almost impossible to determine which of the hats mentioned by early writers were what would now be called by that name, and which were *salacots*. The latter may well have been introduced with the first Malay settlers, but the various types, of which there are many, are distinctly local. Many writers have mentioned the tendency of the Filipinos to imitate, and it is probable that hats, in the strictest sense, were first made here, either at the direct instigation of the Spaniards, or in imitation of those worn by them. They are nearly always called by the Spanish name of *sombrero*, for which there seems to be no exact equivalent in any local dialect.

Attempts to ascertain from the literature and by inquiries, the dates of origin of the work in definite localities have brought little result. However, there is a definite tendency to fix the date as about two centuries ago, and to indicate the materials originally used as *nito* and *bejuco* (rattan). At Baliuag and Pulilan, adjoining towns, each making more hats for export than any others in the Philippines, these statements are considered to be substantially correct. At present, the people of these two places use bamboo almost exclusively, but this material is said not to have been employed for more than about forty years. The most costly and beautiful hats of Baliuag are still made from *bejuco*; the use of *buntal* (the fibro-vascular bundles of the petioles of the buri palm), there is so recent, that it has been employed for little more than two and a half years, but this has resulted in the production of a new kind of hat, of very superior quality.

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[17] Ic. 6 (1801) 74.

[18] A free translation is: "In Nabua, in the province of Ambos Camarines, Luzon, the inhabitants make various articles from the stems of *nito*, *Lygodium semihastatum*, hats especially, sometimes of the natural color of the dried stems, sometimes variegated. The stems, after cleaning, are divided longitudinally into such slender strips that a weaver takes nearly a month to make a single hat."

[19] Fl. Filip. (1837) 822–824.

At Calasiao, through statements made to the older people by others long since dead, there is evidence of a well-established industry a century ago, and documentary statements to the same effect are cited below. The belief there is that the date should be set back to about the two century mark.

Mavitac also ascribes this period to the use of the leaves of the species of pandan called *sabotan* for hats, but the better grades have been made for sixteen years only. At many other towns along the northern and eastern sides of Lake Bay, the industry is getting a foothold, with *sabotan* as almost the only material. At Tanay and Pililla, in Rizal, its use for mats is claimed to go back from one to two centuries; at the former place, hat-making is only now getting under way, but Pililla, in a time said at the most to be eight years, has acquired more than a local reputation. In Laguna, from Mavitac, the work is extending through Siniloan, Pangil, Paquil, and Paete, with a very little done at Santa Maria. To Mavitac undoubtedly belongs the credit for the introduction of this excellent material; people from Pililla learned the work there; Santa Maria does nothing except for local use or as presents, although a considerable fraction of its women understand the work: it is not the custom of the town. The work in the other towns of this district is due to the efforts of the Bureau of Education.

Some of these places are using buri-leaf and *buntal* as well, but the distinctive material is *sabotan*. However, it is curious that the original locality for the hat generally called Baliuag *buntal* is Mavitac, it having an entirely independent origin in the two places. In another sense, this is not at all strange, as the method of weaving in these towns is very similar, and has merely been applied to a material previously considered typical of a third locality, which has a distinctive method. Even yet, very few hats of this kind have been made in northern Laguna, as the makers find the work difficult. There is no commercial inaccuracy in retaining the term Baliuag *buntal*.

Sabotan is a species of pandan, and about half way down the eastern side of Lake Bay, it is replaced by a different species of that genus, excellent for coarse hats, but impossible for anything of higher grades. Commercially, the use of this second pandan may be said to be confined to the two towns in the southeastern corner of Laguna, Majaijai and Luisiana. At the former, it has been used for about two hundred years, at the latter about fifty. At both there is an extension of the *buntal* work from Lucban, in Tayabas, but this is of recent date, at Luisiana this began in 1900, at Majaijai the first teaching commenced in September, 1904. The result of the latter is the most conspicuous success of the school work in the Islands, as the town not only supplies all its own wants, but exports hats to the value of 400 pesos per week. At Lucban, the *buntal* work is of long standing, but I have been unable to obtain estimates.

The quotation already cited from Cavanilles gives the earliest data procured for the southern provinces. Tomas de Comyn, in a work written about 1810 and published in 1820, mentions "Sombreros de nito superfinos Albay y Camarines" and "Sombreros de bejuco de colores Pangasinan,"[20] the latter doubtless from Calasiao.

Buzeta's dictionary, the materials for which were largely compiled before 1842, refers to the making of fine hats at Baliuag and San Isidro (now Pulilan) in Bulacan, Calasiao in Pangasinan, and Camaligan in Camarines. This work also has the earliest reference found to an existing export trade. In 1841, "La Australia * * * Sidney saca sombreros;" and "Manila exporta para dicho punto (Singapur), sombreros y petacas de bejuco y nito."[21]

Mallat[22] notes hats of *bejuco* and *nito* as made in Bulacan, but says nothing of its present chief material, bamboo, this being in accordance with local tradition.

Jagor, who visited the Philippines in 1859 and 1860, describes the Manilans as wearing *salacots*, refers to the cigarette-cases of Baliuag, but not to its hats, and figures the knife still often used there for preparing the strands, speaks of fine *buntal* hats made at Lucban, cheap bamboo hats and more expensive *salacots* in Camarines, and figures a *nito salacot* from the Visayas.[23]

The Sociedad economica del Amigos del Pais, so active in the commercial development of the Philippines half a century ago, appropriated 500 pesos to buy specimens illustrating the industries of the country for exhibit at the London Exhibition of 1851. Their minutes have been destroyed by fire, but copies of the official reports have been obtained through the kindness of Lieutenant-Colonel D. Prain, Director of the Royal Botanic Gardens, Kew. They speak in the highest terms of the material *bejuco* and of cigarette-cases woven from it, for which medals were awarded. The actual hat exhibit seems to have been confined to the crown of one of *bejuco*. In 1862, a more extended exhibit was made, including hats from Pangasinan, mats from Pangasinan, Zambales, and Bulacan, and cigarette-cases.

A very wide variety of Philippine products was shown at Madrid, in 1887, and among these, hats took a prominent place, representing many localities and materials. The list is so extended that it may be taken as a a good index of the industry at its height under Spanish auspices. Omitting a fairly large exhibit of Igorot work, a much smaller one of Moro origin, as well as helmets, nightcaps, and hats the locality of which is doubtful, the following is a summary.

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[20] Las Islas Filipinas progresos en 70 años. Reprint (1878) 195, 196.

[21] Buzeta, M. Diccionario geográfico, estadístico, histórico, de las Islas Filipinas. 1 (1850) 234.

[22] Mallat, J. Les Philippines. (1846) 192.

[23] Jagor, F. Reisen im Philippinen (1873) 25, 48, 59, 128, 227.

Sombreros of bamboo from the provinces of Bulacan and Iloilo; *nito*, Albay and Camarines; bamboo and *nito*, Bulacan and Iloilo; rattan, Albay; bamboo and rattan, Bulacan; fine buri, Pangasinan; buri, Pangasinan, Tayabas, Albay, Cebu, and Burias; *buntal*, Tayabas, Bulacan, Albay, and Cebu; pandan, Laguna; *nipa*, Samar; *cogon* (a grass), Albay; *abaca* (hemp), Albay and Samar; gourds, Ilocos Sur; and of woods, from Zambales, Nueva Ecija, Bulacan, Rizal, Tayabas, Albay, Cebu, Capiz, all of these probably better classed as *salacots*.

Salacots of bamboo, Iloilo, Tayabas, Batangas, Laguna, Albay, Rizal, Bataan; rattan, Tayabas, Abra; *nito*, Ilocos Sur, Union, Pangasinan, Tayabas, Batangas, Albay, Iloilo, Bohol, Cebu; rattan and *nito*, Cagayan de Misamis; *nito* and silver, Cagayan (Luzon) and Tayabas; bamboo and rattan, Ilocos Norte, Lepanto, Albay, Iloilo; bamboo and buri, Antique; fine buri, Pangasinan; pandan, Laguna; *nipa*, Samar; *anajao*, said to be from Manila but more probably from the provinces; gourds, Cagayan, Union, Abra, Cebu, Samar; bark, Iloilo, Camarines Sur; wood, Tayabas, Bulacan, Laguna, Iloilo.

Definite figures regarding exports are available from 1848, those for the years 1848 to 1856 being given by Ellis,[24] those from 1854 to 1902 tabulated in the Philippine Census report of 1903,[25] and later data being furnished by the Customs reports. It is unfortunate that where the first two sources overlap, the figures are quite different. According to Ellis, the total export from 1848 to 1854, the data for the two succeeding years being obviously incomplete, was 208,538 hats. Australia took 162,496; the United States 35,172; California and Pacific Coast, separately enumerated as additional, 5,642; Europe 5,228. Australia is credited with 57,364 for 1854, over 20,000 in excess of the total for that year as given by the census; in 1850, the United States bought 25,880.

From the beginning, there has been a remarkable annual fluctuation, both in the grand totals and in those for the various countries, with increases or decreases in value not at all in agreement. Thus, from 1867 to 1873, the number rose from 25,826 to 102,216, but the value fell from 28,852 dollars to 16,976 dollars. The general tendency has been strongly upward, the maxima being 57,364 hats in 1854, 83,785 in 1855, 102,216 in 1873, 367,745 in 1882, 253,323 in 1888, after which there seems to have been a great decrease until after the American occupation. Recently, the increase has been very decided but still with fluctuations, the totals for the calendar years from 1906 to 1909 being 627,307, 579,659, 391,328, and 592,961, of a total value of 787,260 dollars American currency.

For some time, France has been much our best customer, buying in the four years cited, 873,518 hats valued at 366,597 dollars, nearly 40 per cent of the total number and over 46.5 per cent of the value. The United States took 426,627; Great Britain, 408,346; Australasia, 99,268;

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[24] Ellis, H. T. Hongkong to Manila (1859) 288, 289.

[25] 3: 468.

Italy, 93,466; China, including Hongkong, 91,381; Germany, 86,856; other European countries, 109,134; all others, 2,659. The increase in 1909 means rather more than the mere numbers indicate, because of the large size of many of the hats.

The figures for the first six months of 1910, the latest at present available, appear to indicate a distinct change in the localization of exports, the United States taking over 39.5 per cent of the hats, valued at over 49 per cent of the whole. More definitely, out of 215,246 hats valued at 123,281 dollars, the United States received 85,195; France, 76,079; Italy, 19,327; China, 17,114; Great Britain, 7,540; Austro-Hungary, 4,358; Germany, 3,465; Australasia, 1,218; Belgium, 515; Hawaii, 420; and Guatemala, 15. The trade in the past has undergone such great fluctuations, that too much emphasis should not be placed on these figures. On the other hand, it is to be hoped that they indicate a permanent tendency to increased trade with the United States.

The comparative position of this industry is little realized in the Philippines. Taking for example the exports for 1909, a typical year, hemp, copra, sugar, and tobacco are in a class by themselves. But among secondary products, hats are second in value only to maguey, and the latter is a very recent development and of importance to a smaller number of individuals. Furthermore, the repeated references in this paper to the export trade must not be taken to imply that this comprises the greater part of the output. For some localities, this is emphatically true, but there is also a considerable interisland trade in hats, a much greater one between different places on the same island, and local consumption is to be added. Statistics on these latter points are not procurable, but it is probably not far wrong to say that the export is about one-fourth of the total production. Speaking roughly, a distinction should be drawn between the hats exported in quantity and those which find their way to the local market. Ordinarily, the local market gets the most expensive as well as the cheapest. Coarse workmen's hats of buri leaf or pandan are sold in great numbers at such prices as 15 or 20 centavos apiece; while a high percentage of the best hats are offered in Manila at prices depending on the seller and still more on his estimate of the buyer, but likely to run from 3 to 40 pesos per hat. The true price of these is often far above the average, usually from 1.20 to 20 pesos. By far the greatest number of the higher grades exported go in small lots or singly, shipped by resident Americans to their home towns for sale, or as presents. Hats of the highest grades are after all very few in number, and while they give a distinct tone to the industry, are not serious factors in trade. The problem is to fix upon the material or materials from which hats can be produced in large quantity and at moderate prices, and at the same time be suited to the trade of the countries to which it is proposed to export them.

In Manila, workmen's hats are nearly always of buri-leaf or of pandan, *salacots* being next in number. Nearly all the other Luzon makes are also for sale in this city, but there is a very distinct preference for stiff straw hats, either actually imported, or made in Manila from imported straw. There is also a large and increasing percentage of hats of the same shape and stiffness as straw hats, but with the outer covering made of buri or bamboo, the typical products of Calasiao, Baliuag or Pulilan, Apalit, and Lucban, probably in this order of frequency. This is an important departure, but as yet has hardly spread to the export trade. If this type of hat can be produced at a sufficiently low price, it may well become an important factor. Nothing strikes an investigator as stranger than the small number of high grade hats worn in the towns where they are made, *sabotan* alone seeming to hold its local market. This is not true of cheap hats, which in many places are made for local use only.

SPECIES OF PLANTS USED.

Excluding such substances as manufactured cotton and imported materials, the following is a list of the plants chiefly used for hat making or similar work. It is probable that various others are at present employed from time to time, either experimentally or very locally; also that others used in the past which have remained unrecorded, have given way to superior materials. It is practically certain that still others are taken for the framework or interior portions of *salacots*.

FILICES. (Ferns.)

Lygodium circinnatum (Burm.) Sw. Syn. (1806) 153.
L. japonicum (Thunb.) Sw. in Schrad. Journ. 1800² (1801) 106.
L. semihastatum (Cav.) Desv. Prodr. (1803) 203.

Material obtained for establishing the identity of the species used for *nito* hats at Calasiao and Baliuag, has proven to be the first of the three; all three were used in Blanco's time; Née's note on *L. semihastatum* has been quoted on page 97. As the species have much resemblance to one another, it is probable that yet others have been or may still be used. *Salacots*, cigarette-cases, and baskets, are also made, in whole or part, of this material.

SPERMATOPHYTA. (Flowering plants.)

PANDANACEÆ.

It is probable that a complete list of the pandans that have been used in these Islands at one time or another, for hats, mats, or *salacots*, would be an enumeration of our species of *Pandanus*, the very rare ones perhaps excepted. At present, one species has a great and increasing importance, a second furnishes a considerable fraction of the coarse hats used in Manila and its vicinity, a third has a similar position in southeastern Luzon, two others are known to be used occasionally, and another two have recently been abandoned.

? **Pandanus sabotan** Blanco Fl. Filip. (1837) 779.

The plants from which *sabotan* is obtained, are known with certainty, but their botanical position is in doubt, owing to the fact that no flowering or fruiting specimens have ever reached the hands of a botanist. It has been taken for granted that the plant of this name is *P. sabotan* Blanco, but the identification is in doubt in two ways. Blanco's description was drawn from a single small specimen sent him from Laguna, and Professor Ugolino Martelli has called attention to the fact that *For. Bur. 2700*, which is true *sabotan,* does not agree with Blanco's statements. This specimen he has identified as *Pandanus tectorius* var. *sinensis* Warb.[28] The matter is of importance, in the correlation of our materials with those of Formosa and Hawaii. On the other hand, Blanco's economic notes, and the description of the leaves, so far as it goes, would apply better to *P. utilissimus* Elmer. But it is inconceivable that he could have had even one typical leaf of that species, the economic pandan of southeastern Laguna, or he could not have failed to mention the great size of the leaves, which are 4 to 5 m long. Indeed, his statement that he had a small specimen may leave the matter permanently in doubt.

Sabotan has been cultivated in towns along the northeastern shore of Lake Bay for two centuries, and fairly exhaustive investigations of it have been made in the preparation of this paper. At Tanay, Rizal, it is said to have flowered and fruited in 1903; at the adjoining town of Pililla, it is said to have flowered in recent years, but not to have fruited; at Mavitac, from which it is best known, only occasional old people claim to have seen fruit or to have seen others who had. The description by the people of Tanay is given for what it may be worth, namely, that the head of fruit was as long and as thick as a man's forearm, the arm used as an illustration being a fairly stout one. If this is true, it can not be related closely to *P. tectorius* Soland., nor to any other known Philippine species. Repeated questioning in every town where it is of importance, and in many others, as to whether it had ever been found wild, invariably met with negative answers, except in a solitary instance. That was carefully investigated, and a man was found who remembered when the individual plants had been cultivated. The species is often wild in the sense that it has been abandoned. The absence of fruit is no obstacle to its introduction or cultivation, as the plants bear numerous suckers at the base. The leaves are slow-growing, and vary in texture with age and the amount of shade. This pandan is abundant in the three towns named, also at Siniloan, Laguna. It is present in small quantity in several places near them, and has recently been introduced elsewhere.

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[28] This Journal 3 (1908) Bot. 63.

Pandanus utilissimus Elmer Leafl. Philip. Bot. 1 (1906) 81.

This takes the place of the preceding species from San Antonio, where it is wild, south to the country north of Mount Banajao and Mount Banajao de Lucban, in Laguna and Tayabas. It is remarkable for the large size of its leaves and fruits. In the towns where it is most used, it is called *pandan* or *pandan totoo*, but at San Antonio, the name *bangcoan* appears, and it is this which is employed in Manila, when its identity is not lost in the term *balangot*. Both of the above species are used for hats, mats, bags, and baskets.

Pandanus tectorius Soland. ex Parkinson Journ. Voy. H. M. S. Endeavour (1773) 46.

P. coronatus Martelli in Philip. Journ. Sci. 3 (1908) Bot. 65.

These closely allied and perhaps identical species seem to be used, but only in small quantity and in out of the way places, from which it is difficult to get accurate information.

Pandanus simplex Merr. in Bur. Govt. Lab. Publ. (Philip.) 29 (1905) 6.

This is the species of southeastern Luzon, from which the coarse hats known as *caragumoy* are made.

Pandanus luzonensis Merr. loc. cit.

This was formerly used under the name of *dasa* in the country near Antipolo, Rizal, but has been replaced by *sabotan*. It is possible that it is still occasionally employed by the hill-people of that province. In Nueva Ecija, some pandan, probably this species, is gathered by Negritos, for this purpose.

Pandanus exaltatus Blanco Fl. Filip. (1837) 778.

This also was formerly used near Antipolo, where it grows to a height of 10 to 12 meters: its use, also, has been abandoned. Locally, it is called *pandan*.

Pandanus copelandii Merr. in Bur. Govt. Lab. Publ. (Philip.) 17 (1904) 7.

This species is widely distributed, but in many localities where it is abundant, it is not used for textile purposes. However, among its names are some which are alleged to be those of hat materails.

GRAMINEÆ.

Bambusa blumeana Schult. f. Syst. Veg. 7^2 (1830) 1343.

This furnishes the material for almost all the bamboo hats of the Philippines, which form a large majority of all kinds exported, although the preponderance imputed to it in official reports is exaggerated. It is nearly the exclusive material of Baliuag and Pulilan, Bulacan, each of which makes more hats than any other town in the Philippines. Another bamboo, *bocaue*, of which the identification is uncertain, is rarely used for hats, but it is considered to be inferior to the other; it is probable that other species are used for *salacots*.

Apluda mutica Linn. Sp. Pl. (1753) 82.

Occasionally used for hats in Samar, and in Bohol, where it is called *magcauyan*.

Andropogon zizanioides (Linn.) Urban Symb. Antill. 4 (1903) 79.

Andropogon muricatus Retz. Obs. 3 (1783) 43.

A material, properly called *Tientsin*, is imported here from China, and used as wicks in native lamps under the name *timsim* or *timsin*. Some years ago, a very similar, but not identical material, was imported for hat making, and these hats sold as *timsin*. They have the appearance of those known to be made from *Andropogon zizanioides* or its varieties. The production of hats from the latter material is in part a promising departure in school work, but in Panay it is of some commercial importance. The local name for the species is Spanish, *moras*, but this also has been corrupted, usually to *mura*. In Pampanga, it is called *aniás*.

Oryza sativa Linn. Sp. Pl. (1753) 333.

It has several times been asserted that native-grown rice straw is used for hat making in the Philippines. Over the greater part of the area it is certain that this is not true, but imported straw of this and other cereals is used in Manila.[27]

Saccharum spontaneum subsp. **indicum** Hack. in DC. Monogr. Phan. 6 (1889) 113.

Used in Bohol under the name *bugang*, also to some extent in school work.

CYPERACEÆ.

Cyperus malaccensis Lam. Encycl. Tabl. 1 (1791) 148.

To this species, as a plant, more than to any other, the name *balangot* belongs, and information seems sufficiently authentic that its dried stems were formerly woven into hats and mats. They are still used as string, and within a few years have replaced imported materials for the woven upper parts of the native slippers called *chinelas*. The only other use known to me is as a woven protection for bottles. It is frequently asserted that it still persists as a material for hats and mats. I can only report that I have visited every town of which any such statement has been made to me, and these were in six provinces, and have failed to find hat or mat or any local information regarding the use of *C. malac-*

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[27] Mr. Miller records braided rice straw from Ilocos and other provinces to which Ilocanos have migrated.

censis for this purpose, except in one school. Still, it may well happen that here and there a woman may make a hat from this material for use in her own family. In Manila, the name *balangot* as applied to hats is now tending to fixity for *Pandanus utilissimus* Elmer. This subject is further discussed under the heading of *balangot* hats, on page 120.

Fimbristylis utilis Elmer Leafl. Philip. Bot. 3 (1911) 855.

This species extends down the eastern side of Luzon, through the Visayas to Mindanao. In the Visayas, it is second only to buri, for hat and mat work, being used on Samar, Bohol, and Panay, in the two first under the name *ticog*, in the last under that of *tayoctayoc*.

PALMACEÆ.

Corypha elata Roxb. Fl. Ind. 2 (1824) 176.

Three different parts of the leaves of the buri palm are used for hats, giving four classes of high grade, and two of cheap products, one of which might be subdivided.

The fibro-vascular bundles from the petioles of mature leaves are called *buntal*, and are woven in two ways, producing two distinct classes of hats, both of high grade. The first is characteristic of Lucban, in Tayabas, and towns near it, both in that province and Laguna, but made in smaller quantity elsewhere: the second, a recent departure, is practically confined to Baliuag, Bulacan.

The midribs of the leaf-segments of unopened leaves furnish both hats of superior quality and also of cheap grades. The hats are most often called by the name of the town of Calasiao, in Pangasinan, as this is almost the only place in Luzon where buri is used in this way. There is also an important industry in this kind of hats in Panay, especially in Pototan and Dumarao.

The Lucban hats have an importance in the export trade second only to those made of bamboo, but, in the local trade, the third kind of material, the actual leafy tissue, supplies more hats than any other in the Islands. These are made in a great many places, southeastern Pampanga producing a greater number than any other region, with Laguna-Tayabas second. They are almost always cheap or very cheap, but there are rare and scattered cases of high-grade products, at and near Lucban, on Sibuyan, and at Danao, Cebu. In this paper, they are called "buri-leaf" hats.

Calamus mollis Blanco Fl. Filip. (1837) 264.

In many places, this rattan was the original material employed for hat making, but through its growing scarcity and high price, it is now less often used. However, the hats are the most highly prized of all, the most beautiful, and probably the most durable. Most of those now seen are made at Baliuag.

Nypa fruticans Wurmb. in Verh. Batav. Gen. 1 (1779) 349.
Areca catechu Linn. Sp. Pl. (1753) 1189.
Cocos nucifera Linn. Sp. Pl. (1753) 1188.
Livistona spp.

All of these species yield materials which are used for *salacots,* the coconut rarely is utilized in school work for hats, and a considerable number of baskets are made from its midribs in Bohol.

MUSACEÆ.

Musa textilis Née in Anal. Cienc. Nat. 4 (1801) 123.

The cloth, *sinamay,* woven from this, is sewed into hats. Very fine qualities of hemp from the Philippines are prepared in Switzerland, and the resulting strands or ribbons are used for hats, lace, and many other products; the leaves are sometimes used in *salacots,* as are those of *M. sapientum* Linn. and *M. paradisiaca* Linn.; the actual hemp is sometimes used for hats in school work.

MARANTACEÆ.

Donax cannaeformis (Forst.) Rolfe in Journ. Bot. 45 (1907) 243.

Stems used in *salacots.*

ORCHIDACEÆ.

Dendrobium sp.

Sangumay, sometimes mentioned as a hat material, is the outer surface of the pseudobulbs of an orchid of this genus, but is only a trimming for *salacots.*

MORACEÆ.

Artocarpus blumei Tréc. in Ann. Sci. Nat. Bot. III 8 (1847) 111.

Leaves used for *salacots,* at least on Basilan.

LEGUMINOSÆ.

Enterolobium saman (Jacq.) Prain ex King in Journ. As. Soc. Bengal 66^{2} (1897) 252.

Occasionally, hats have been made in the province of Bulacan from shavings of the wood of this tree.

STERCULIACEÆ.

Bast, which from its structure is almost certainly obtained from some species of this family, is occasionally made into pretty freak hats. The workers are unnecessarily timorous and have deliberately given false information regarding its identity.

Pterocymbium tinctorium (Blanco) Merr. in Bur. Govt. Lab. Publ. (Philip.) 27 (1905) 24.

The wood of *teluto* is sometimes cut into hats of typical straw-hat shape.

CUCURBITACEÆ.

Luffa cylindrica (Linn.) Roem. Syst. 2 (1846) 63.

The inner lining of the fruit of this species, and especially its wild varieties is fibrous, and used as sponges. Cut into strips, and woven or sewed together, it makes a freak hat.

Lagenaria vulgaris Sér. in Mem. Soc. Phys. Genève 3¹ (1825) 25.

This gourd, called *upo* by Tagalogs and *tabungao* in Ilocos, is halved, hollowed, and used for a hat or rather *salacot:* the edges are often trimmed with *nito*.

NATIVE MATERIALS NOT OF PLANT ORIGIN.

Horsehair was formerly used at Baliuag for hats, but has been abandoned, although cigarette-cases are still made from it, both there, and in greater quantity at Calasiao.

In the manufacture of *salacots*, many different materials have been used. Some of the most beautiful and costly have been made of tortoise-shell, they and others were often adorned with gold or silver: fish-scales have sometimes been employed.

MATERIALS OF OTHER EASTERN TROPICAL COUNTRIES.

As compared with other tropical countries, our materials show most resemblance to those of Java. The true "Panama-hat" plant, *Carludovica palmata* Cav., grows in the eastern tropics only in cultivation. It has been introduced here, but so far in very small quantity. The indications are that it can be grown successfully.

The chief hat material of Formosa is taken from *Pandanus tectorius* Sol., the hats themselves greatly resembling our *sabotan*. *Scirpus triqueter* Linn. is also used. The "Kona" hats of Hawaii are also made from *Pandanus tectorius*.

In Madagascar, several species are used,[28] the best a palm, *Phloga polystachya* Noronha, four of the five next most suitable belonging to the *Cyperaceae;* pandans likewise are used.

In Java, on the other hand, there is a larger industry in bamboo than in the Philippines, and probably a different species is used there than here Many cheaper hats are made from pandan.

Coarse bamboo hats are made in Tonkin, probably from *Bambusa blumeana*.

Nowhere does the buri seem to have an importance comparable with that in these Islands, although the best authorities identify our species with one of other countries. Moreover, *nito* (*Lygodium*) and *bejuco* or rattan hats are rather distinctively Philippine.

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[28] Perrot & Goris in Agric. Prat. Pays Chauds 7² (1907) 203–213, 402–411, 476–486, *pl. 1–13;* Kew Bull. Misc. Inf. Addl. Ser. 2 (1901) 272, 273.

MEANS OF DISTINGUISHING THE PRINCIPAL KINDS OF PHILIPPINE HATS.

The following, arranged somewhat in the form of a scientific key, aims to give what are in practice, the chief differentiating characters.

- **A. Hats, not freaks, with curving brims and rounded crowns.**[29]
  - **Strands circular or nearly circular or flattened by pressure, but not obtained by the division of wider materials, their margins therefore rounded.**
    - **Strands usually less than 1 mm in width, with few (usually 1 or 2) inconspicuous longitudinal lines.**
      - White or pale-pinkish or yellowish .... **Buntal**
        - Open weave .... **Lucban**
        - Close weave .... **Baliuag**
      - Brown to black .... (an old and rare type of) **Nito**
    - **Strands or some of them usually greenish, usually wider, with several conspicuous longitudinal lines** .... **Tieog or tayoctayoc**
  - **Strands flat or nearly so, obtained by the division of wider materials, their margins therefore showing more or less evidence of cutting.**[30]
    - **Strands appearing as if varnished, the outer layers of tissue often cracking, greenish-yellow to brownish, always coarse** .... **Pandan (bangcoan, balangot)**[31]
    - Strands dull to silky in appearance, of all degrees of fineness.
      - **Strands with very evident cross-veins** .... **Buri-leaf**
        - Plaited before weaving .... **Los Baños**
        - Not plaited .... **Ordinary grades**
      - **Strands without evident cross-veins.**
        - **Hats, brown or black (natural color)** .... **Nito**
        - **Hats not brown or black or in rattan or cheap grades of buri-midrib with an admixture of light-brown strands, or in bamboo often dyed, but very seldom the entire hat.**
          - **Hats grayish- to bluish-green except when bleached, the strands not divided as regards thickness** .... **Sabotan**
          - **Hats white to pink or very pale-yellow, the strands divided as regards thickness.**
            - **Hats silky or satiny in appearance, with slightly darker color than either of the following two** .... **Rattan**
            - **Hats white or very pale-pink, with a glossy appearance, but much less so than rattan** .... **Bamboo**
            - **Hats similar to bamboo, but never with any trace of pink, in cheap grades only with admixture of light-brown, always of rather dull appearance** .... **Buri-midrib**[32] **(Calasiao)**

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[29] The "block-hats" of Mr. Miller's paper.

[30] **The nature of the margins can usually be determined by the eye, in critical cases slight magnification is desirable.**

[31] **See pages 104, 119, 120.**

[32] **The bamboo and Calasiao hats are much the most difficult to distinguish, but in practice the latter are usually told with ease by the quantities of rice powder placed upon them in the process of finishing. The brownish color of some strands is considered an imperfection, and is not found in hats of better grade. See page 116.**

B. Freaks.
Made from actual pine-shavings .... **Palo de China**
Made from the inner bark of a tree .... See pages 107, 124.
Made from fibrous material from the fruit of a gourd .... **Patola or tabubao**
Made from sinamay cloth, cut and sewed .... **Sinamay**
C. Stiff hats with flat brims and crowns.
Actually cut from wood .... **Taluto, perhaps also dapdap**
Plaited straw of imported cereals .... **Straw hats in strict sense**
Made from stiff, wiry grass-stems, not plaited before weaving, usually greenish **Timsim (so-called), moras, or anias**
Hats with a woven outer covering over very coarse bamboo, buri, or other material .... **Calasiao, bamboo, buri-leaf, buntal (Baliuag), buntal (Lucban); to be distinguished as above.**

BAMBOO HATS.[38]

According to official figures, about seven-eighths of the hats exported from the Philippines are made from bamboo. There is much reason to believe that this proportion is exaggerated, but on the other hand, there can be no doubt that bamboo hats form much more than a majority of all sent from the Philippines, yet, in the local trade, they occupy a comparatively minor position.

In spite of the large output thus indicated, bamboo is used on a large scale for hat making and similar purposes only in two adjoining towns, Baliuag and Pulilan, in Bulacan. Further, while 25 Philippine species of bamboos have been satisfactorily identified, and others are known of which it has been impossible to obtain flowering material, practically all these hats are made from one species, *Bambusa blumeana* Schult. f., known in Bulacan as *cauayan totoo* (true bamboo). The Spanish-Filipino name is simply *caña* or *caña espinosa*, equivalent to the name most frequently used by Americans in the Islands, "spiny bamboo." Materials from this bamboo are used in various other towns to a slight extent, but not on a commercial basis. It is not to be inferred that this bamboo is confined to these towns, for its Philippine distribution is very wide, and should increased production of bamboo hats become profitable, abundance of material is at hand in scores of places.

In the two Bulacan towns mentioned, hats are classed as of 5 grades, *muy finos, finos, medianos, regulares,* and *ordinarios.* For the first of these, it is unusual to use any other material than rattan, but for the others bamboo is almost exclusively employed. However, Pulilan, with an output estimated at 4,000 to 5,000 per week, makes almost entirely the lowest grades, while the 3,000 of Baliuag contain many of the higher, the town having a long-standing reputation for the excellence of its work.

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[38] The descriptions of the hats and their manufacture are here greatly condensed, as the ground is fully covered in Mr. Miller's paper. Little more is retained than is necessary to lay the foundation for the discussion of general problems, except when there is some definite purpose to be served.

Briefly, the material is obtained from the upright stems in August or September, and a slight quantity from the curving branches, or later in the year. The lowest 2 to 3 meters of the stem are not used, and but little from near its summit.

The stems are cut, divided into joints, the nodes cut away, the internodes longitudinally halved, the parts nearer the hollow interior removed, and the thin remaining outer part pulled out in sheets, which may again be split. The number of layers varies at the judgment of the worker, but those nearest to the useless, outer, green surface give the best material. These sheets are boiled, dried, split into strips of the desired width, and made of the required thickness. They are often dyed, formerly with native dyes, now usually with aniline.

The form of the apex of the crown is variable, in rosettes, oblongs, etc., the beginning being usually made with two sets each of about 6 strands at right angles to one another, new material being introduced as required by the increasing diameter or by approaching the ends of the strands. The weave is an alternation of two strands with one, often changing into three or four with one, when additional strands are introduced.

Only the very cheapest hats are single, practically all on the market being double. This means that there are made what would at first sight be supposed to be two distinct hats, one of them almost always coarser than the other. When these have been woven down to the brims, the coarser is placed inside the other, and the two woven together at the margins of the brim, resulting in a much more durable hat than if it were single.

Estimates of the time required for the weaving should be understood in connection with the conditions under which it is done. Thus, not only has time to be taken from the work for all household duties, but there is a distinct preference for the cooler and more humid parts of the day, especially for better grades of work. Ordinary commercial hats require about a day's work, higher grades longer, even months. The real prices, if there can be said to be such, run all the way from perhaps 15 centavos to 25 pesos apiece, but the vast majority of the hats cost between 50 centavos and 2 pesos each. There is much difference of opinion on such questions as the comparative superiority of different kinds of hats. As contrasted with *buntal,* there is no question that the single strands of the latter are stronger than those of bamboo, but when the hats themselves are considered, the method of weaving comes into consideration, bamboo being woven much closer than *buntal,* except in the recent use of the latter at Baliuag. In practice, a bamboo hat is apt to break sooner than one of *buntal,* along the lines where it is folded in shaping, elsewhere the bamboo has the advantage. Further, the fineness of the separate strands must be considered. Bamboo is a split material, and can thus be made in very many grades. Finer division, adding to the labor, time, and price of the hat, does produce a more durable as well as a handsomer article, although it is possible to carry the process too far. *Buntal* is not divided, and can not be, the strands being of the natural size. The dealers claim for a bamboo hat of medium grade, costing perhaps 3 pesos, a duration of 3 years, the year including 12 months in which it might be worn. In this time, it would require several cleanings, and the process of cleaning is a critical period in the life of the hat. One hat was shown me, which was said to have been in constant use for 12 years and to have had 25 cleanings. It was still in excellent condition, except for an apparently accidental injury along one margin. It was a high grade bamboo, and at present prices would have cost 18 to 20 pesos.

In use, there are still other factors. The weave of *buntal* is too open for daytime wear in the Tropics by white men; but for evenings, for those who are natives of the Tropics, and for summer use in temperate regions, this open weave creates no difficulties. It is prettier than the ordinary grades of bamboo, which is adapted to all conditions, but when it is compared with the higher grades of bamboo, the decision is a matter of taste, although the actual hats are of very different appearance.

Finally, into the export problem comes the question of competition. Here *buntal* has the advantage, as it is unique, whereas Philippine bamboo has to meet very severe rivalry in the products of other countries.

None of the above criticisms apply to the Baliuag weave of *buntal*. On the other hand, it requires more material than the Lucban hat, and the work takes a disproportionally longer time, as it is more difficult. As a result, these hats are double the price of ordinary *buntal*, so that they can not be exported in large quantities under present conditions. In small lots or at lower prices, they should command a ready sale, as they are very beautiful and durable, coming, among Philippine hats, second only to rattan, which is still more expensive.

A somewhat recent departure is the making of flat hats, as if they were intended for small mats, for which they might well be used, these being subsequently folded into the shape desired. Much more important for local purposes is the use of bamboo as the outer covering over a stiffer framework, giving all the appearance and advantages of straw hats with greater strength. This will be referred to again under the heading straw hats. Recently, also, large hats have been made in considerable quantity to meet the demands of the export trade, of bamboo, buri, and *buntal*. The workers rarely have any real difficulties in adapting their methods to changing styles, but they are rather averse to change, and apt to meet the wishes of those whose interests are even more their own by a demand for increased prices. This must be considered one of the more serious drawbacks of the trade.

Why the use of bamboo for hats should be so concentrated in Baliuag and Pulilan is somewhat of a mystery, even here in the Philippines, where so many localities adhere to a single main industry. These two places may almost be said to be one, as the main towns are connected by *barrios* or outlying settlements, in all of which hats are made. Yet, Quingua, separated from Pulilan by a small river, takes little part in this industry; Bustos, separated from Baliuag by a larger river, but now politically united with it, is said to take none at all. It may be worth recording that certain aspects of the vegetation at Baliuag, suggest an unusually high humidity, a condition distinctly favorable to hat-weaving. Both Baliuag and Lucban have a businesslike appearance very unusual in these Islands.

Bamboo hats are made on a very much smaller scale at other places, such as Concepcion, in Tarlac, Calasiao in Pangasinan, where they are of very minor importance, in towns of Ilocos Norte, and in the Visayas. In none of these, have they any real commercial importance.

BURI HATS.

These fall into three very distinct classes, with subdivisions, according to the part of the leaf used: all are important.

The buri palm of the Philippines normally grows to a large size, the petioles or stalks of the leaves are about 2.5 m in length, the blade is fan-shaped and as long as the petiole, with very numerous midribs. Where the young leaves are extensively used, they are removed as they appear, in which case the trunk is little or not developed. A tree flowers but once, and then dies, at an age of about thirty years, so that it is difficult to obtain material upon which to base botanical identifications. The Philippine species was formerly supposed to be *Corypha umbraculifera* Linn., the *talipot* palm of southern India, but recent determinations by Doctor O. Beccari make it *C. elata* Roxb., also found in India. It is still an open question if all our plants are referable to one species.

The three parts used are the actual leaf-tissue, the midribs of the leaflets, and the fibro-vascular bundles of the petioles. The last is *buntal*, both the others are usually included under the name buri or its equivalents, but have additional names hereafter noted. Buri-leaf hats are made in great numbers and in many places, but so far as Luzon is concerned, the other two classes are considered distinctive of a single region, *buntal* of Lucban in Tayabas, and buri-midrib of Calasiao in Pangasinan. The midribs are also used on Panay, especially at Pototan and Dumarao, and *buntal* has recently been imported and woven at Baliuag. So far as information has been obtained, no town uses the leaves in all three ways, but this is less wasteful than it may seem, as if the fibro-vascular bundles were taken from the unopened leaves, which are used for the buri-leaf and buri-midrib hats, they would not be sufficiently strong for use as *buntal*.

Hats made from the leafy tissue are usually very cheap, even on the Manila market they sell as low as 15 centavos and rarely for over 40 centavos each. The preparation is various, even as simple as the mere removal of the midribs, followed by sun-drying, but it is often more elaborate. This material can be recognized with ease by the fine transverse nerves, and these are important in the preparation, as they necessitate a special guide on the knife with which the leaflets are divided into strips. In a very few localities, hats of good quality and attractive appearance are made from buri-leaf, those known to me being Lucban and Tayabas, in the Province of the latter name, the Island of Sibuyan, and Danao, Cebu. These hats sell for much higher prices than the usual ones of this material, in some cases up to 15 pesos each, but are hardly as yet a commercial product. The most striking common divergence from the ordinary cheap kinds is that which imitates pith-helmets. These were originally called *Sebastopol,* and the full name is still sometimes heard, but more often it is corrupted to *bastapol, bistapol, vistapol,* etc., in addition to the general names of the palm, *buri, bulí,* or, from Pangasinan north, *silag*. or in Pampanga, *ebus*.

The ordinary buri-leaf hats are more commonly used in these Islands than all others combined, and they have a certain share in the export trade. More often, they are nearly white or a pale yellow or green, but they are also dyed, in the latter case, white and colored material being usually combined. Los Baños hats, with a temporary popularity a couple of years ago, were made of braided buri. Buri-leaf has an equal use for sleeping mats, called *petates* or *banig,* as well as for large bags, called *bayones*, and for baskets. Most of the hats on the market are from two regions, southeastern Pampanga, especially the town of Apalit, and the buntal district of Laguna and Tayabas.

BUNTAL HATS.

To obtain *buntal*, the mature leaves of buri trees of 10 years of age or more are taken, the blade and spines cut away, and the petiole halved in length. One end of these halves is then cut or bruised, until the fibro-vascular bundles can be grasped, when they are pulled out by force. They are not strong enough to be pulled through the entire length of the petiole, which is the reason for the halving. Thus obtained, they are of about equal length, somewhat over 1 meter, but of different diameter, this fact when the uniformity in material and excellence of weaving is taken into consideration, accounting for the different grades of the hats. The further preparation varies, probably most often consisting in steeping the *buntal* in vinegar for a few hours, boiling in water for an hour, and flattening or smoothing. Until the beginning of 1909, all *buntal* hats were made in one weave, that of Lucban, Tayabas: about that time, dealers from Baliuag began buying prepared *buntal,* which they took to their own town, where it was woven in the same way as bamboo. The Baliuag *buntal* hat is therefore, more closely woven than that of Lucban, and is consequently stronger. It is also more beautiful but more expensive, the hats usually selling from 8 to 13 pesos each, in stores they bring much more. These hats have been offered for sale in Manila from the outset, but in small quantity. Almost exactly similar hats have been made for about 5 years at Mavitac, Laguna, and more recently at Paquil, in the same province, but their total number has been very small indeed, and they have probably never been on the market. Lucban is the chief seat of the *buntal* industry. Other towns in its vicinity, especially Mauban, Sampaloc, Majaijai, and Luisiana, also have an important share in this manufacture, but their output is chiefly sold through Lucban. As a consequence, the name of that town is more often used in the Philippines for these hats than is the name of the material, but outside the Islands, the most common name for them seems to be "Bangkok," although the Siamese city has no trade of its own in hats. The cheapest Lucban hats sell for one peso or one peso and twenty centavos, but the general run of prices is 2 to 6 pesos, the best are 12 pesos apiece. The return to the worker is better than it is in almost all other localities, she receiving about 5 pesos per week, but this amount varies with individual skill. Estimates for the value of the Lucban buntal output range from 100,000 to 250,000 pesos per annum, representing nearly half this number of hats. It is probable that even the higher of these figures is not excessive.

There are a few other special features about the industry in Lucban. Attempts have been made at different times to hire the skilled workers and to bring them together to work, in other words, to establish a factory. but the proceeding has never been a success. A few men are among the weavers, a condition also occasionally met with in Bulacan, but in both provinces they seem to be confined to the coarser work. The weaving of the brims, considered the most difficult part in Bulacan, is here the easiest and is done chiefly by children. A few *buntal* hats are made in other towns, but not in commercial quantities. Among these are places in Bohol, where some of the material called by this name is said to be obtained from the sheaths at the base of coconut petioles.

CALASIAO HATS.

Although in Calasiao itself, the tree from which the hats are made and the hats alike are known as *buri*, or more often *silag*, outside of it, the hats usually take the name of the town. This is well, both because hats made from the buri-midribs should not be confused in any way with those made from other parts of the leaf, and because many curious stories are in circulation regarding the material.

The leaves are cut from the tree before they have unfolded. They are kept for three days in a cool place, spread out, put in the sun for three more days, and spread for a night outside the houses. The midribs are then removed, a leaf furnishing about 100, approximately two-thirds the number required for an ordinary hat. They are graded as of three classes, dark, less dark, and white. It is chiefly the white ones that are used, as the others are rightly considered less attractive, although they furnish at least a part of the material for cheap hats. These midribs are split in two, the soft interior cut away, and the halves again split once or twice, according to size. These strands are made smooth and of the requisite thickness by passing them under the *yuro,* resembling a flat-bladed razor, and are regulated in width by drawing them between two blades, the *batacan.* The material is then ready for weaving. It is very rarely boiled, as this is believed to weaken it.

Only the cheapest hats are single; the doubling being done as with bamboo hats, although the joining is sometimes not as well executed as at Baliuag. In this operation an instrument, is used, called the *socsoc,* resembling an awl; the *sensen,* similar but coarser, being employed to press the strands together in weaving. A smooth piece of *carabao* horn, the *lerler,* shaped like a boot-horn, is rubbed over the strands while the hat is being woven, to smoothen it and improve its appearance. The finishing is elaborate. The hat is washed, with and without soap, lemon juice is rubbed on, and one of the easiest ways to distinguish this type from that made from bamboo, is by the rice-flour and sulphur, with which it is treated.

If selected hats of rattan, bamboo, Calasiao, Panama, Formosa, and *sabotan* were to be placed in the order given, the majority of people would find it difficult to distinguish one kind from those placed next it, and even more so to state the basis for their decision. On the other hand, they could hardly go wrong between hats which are separated by one place. For example, the difference is considerable between rattan and Calasiao, bamboo and Panama, or Calasiao and Formosa or *sabotan.* Of all six varieties, rattan and bamboo are probably most distinct, and bamboo and Calasiao least. These three classes are most easily distinguished by the finish, the rattan hats having an exquisite satiny or silky appearance, and being very soft to the touch. The bamboo hats are likewise glossy, but less so than rattan, while the safest way to tell apart those of Calasiao is by the dull finish. Moreover, rattan hats are darker in color than either of the others, and practically always contain strands of still darker material. Darker strands are also frequent in the cheaper Calasiao hats, but one of good quality should be uniform. These darker strands in the Calasiao hats are different from those of rattan, being yellowish or yellowish-brown, whereas in rattan they are rather a dark pink or pinkish-brown.

Calasiao hats have long had a high reputation for beauty, excellence, and durability, but the returns to the workers seem to be less than in making any other variety. The time required for a 50-centavo hat was given as three days; for a peso hat, five days or even more; for the 5 peso, a month; for the 10 peso, three months. The best estimates for the output were about 500 per week, and the workers also stated that the number has been nearly constant for several years. A few hats of this material are made in a barrio of the nearest town to Calasiao, namely San Carlos; otherwise, the material is not used in Luzon. However, in Panay, it again comes into prominence, in Pototan and Dumarao, and to a less extent in Dao, Passi, and Dumalag. The women of Calasiao itself use other materials as well, buri-leaf, bamboo, rattan, and second in importance to buri-midrib, *nito*. For cigarette-cases, buri-midrib, *nito*, and horsehair are used.

Information has been obtained from authentic sources, that at Camaligan, Ambos Camarines, a fourth portion of the buri-leaf, namely the outer surface of the petioles, is also used for hats. They are said to be of good appearance, and to sell for 3 to 15 pesos each.

Yet a fifth portion of the leaf is used in Bohol, in mat making, namely the thin epidermis or outer surface of young leaves, which is woven on looms. When either this or strips of buri-leaf are rolled, they receive the name *saguran*.

RATTAN HATS.

While this is perhaps the best name to use for general purposes, *bejuco* and *uay* are more common locally. The species used in *Calamus mollis* Blanco, a climbing palm, growing only in the Philippines. It is typically a forest plant, but is cultivated at Baliuag in small quantity. Practically all of the material has to be obtained from a distance, which adds to the cost. The prices have risen considerably in recent years, and it is rarely possible to get a rattan hat for less than 12 pesos and they are more often 18 to 25 pesos. The upper limit is lost in fable, it is alleged to be 1,000 pesos and is at least 300 pesos. The parts used are the intermediate layers of the stem, which are prepared in the same way as bamboo, except that boiling is unnecessary. They are sufficiently strong to permit finer division than any other Philippine material. Consequently, with their satiny sheen, the higher grades of rattan hats are extremely beautiful, but beyond a limit, which may vary with individual taste, they are rather works of art than usable commodities. Nearly all the rattan hats on the market come from Baliuag, Calasiao makes them when ordered, and there is elsewhere a scattered but very scanty production. On the other hand, reason has already been given for believing this to have been the original material used for hats as distinguished from *salacots* in many places in the Islands. The workers say that a second species of *Calamus* is very rarely used, but its exact identity has not been ascertained.

PANDAN HATS.

SÁBOTAN.

Sabotan hats are of many grades, from coarse ones selling for 20 centavos each and worn by laborers, to a very superior grade the price of which, formerly about 8 pesos, is stiffening at a higher figure and is sometimes as much as 15 pesos. Formerly very few of the better grades were made, this part of the work extending back only sixteen years, but there is an increasing production at one peso and upward, the largest number of the better hats selling for about 3 pesos. No more suitable hat is made in the Philippines to withstand tropical conditions. The material is firmer than most other good materials, and the hats afford good protection from intense sunlight and are very durable. The natural color is a grayish or bluish green, and so far, attempts to secure a good bleach have been largely failures. For short periods of time, very satisfactory results have been obtained, but the effect is not permanent. Commercial production of these hats is confined to two towns, Mavitac in Laguna and Pililla in Rizal, adjoining in one sense, connected by a difficult trail and both much nearer other towns than they are to one another. There is no dispute about the facts that the work has been a recent introduction into Pililla from Mavitac, and is becoming nearly as important in the former as in the latter. There is little difference in the hats produced in the two places, if anything, the materials used in Pililla are thicker, and the prices higher. The leaves of this pandan vary in thickness according to the amount of shade in which the plants are grown, and Mavitac's criticism of Pililla is that the people of the latter town do not yet understand this sufficiently. On the contrary, there are those who prefer the Pililla hat, although the writer is not one of them. Use of the material is long-standing, not only in these but other towns near by, but Mavitac only has been engaged in the *sabotan* hat industry for a long time, two centuries as against less than a decade. At present, but few of the better grades of *sabotan* hats are to be seen in Manila, and probably still fewer have been exported, but there should be a distinct increase in both respects.

From Blanco's statements,[34] the name *sabotan* was used, as far back as his time for a species of *Cyperus* which from the notes attached was probably *C. malaccensis* Lam. Nowadays, it is known to be given to a pandan on the east coast of Luzon, which from the appearance of the hats made from it can not be true *sabotan*. These are made at Baler, Tayabas, and are of several grades. The best sell for 60 centavos, and are of distinctly good appearance. They, also, may be an important addition to the minor classes, but it is unlikely that they can be produced on any large scale for many years. The only other use of the name that I have been able to authenticate, is *sabotan buaya* or "crocodile-sabotan" for *Vallisneria spiralis* Linn., the most cosmopolitan species found in the Philippines. It has no economic use, and is so different from true *sabotan* that the name might with equal propriety be given to almost any other monocotyledon.

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[34] Fl. Filip. (1837) 778.

Sabotan leaves are not used until the plant is about 3 years old, and then only the older ones, as they are slow in growth and very tender when young. The apical part is always rejected as useless. The midrib is removed, and the half-leaves wilted in the sun for 2 to 4 hours, and then divided into strips by an instrument of local manufacture, called the *pambulay* or *partidar*. The material is then drawn around a flat piece of bamboo or other suitable object, the main purpose desired being to expel water from the tissues. It is then placed in cool water, usually that in which rice has been boiled, then itself boiled, again put in cool water to clean it, the times for all these processes varying. After drying and smoothing, it is ready for weaving.

At Mavitac, about 100 hats of the better grades are made each month, of the lower grades perhaps 400 per week. If workers' statements are to be credited, the time required in weaving must vary greatly as between different women, the time for an 8 peso hat being given from 8 days to a month. In general, a weaver earns from 50 centavos to a peso per day.

OTHER PANDAN HATS.

Next in frequency to buri-leaf hats for workmen's use in Manila, and indeed most of central Luzon, is a pandan hat made at Luisiana and Majaijai, Laguna, from *Pandanus utilissimus* Elmer.[a] The hats are always coarse and cheap, averaging about 20 centavos each in price, but going higher and lower. They are well suited to the conditions which prevail here. Occasionally, they are worn as a rustic hat, and might have increased possibilities along that line. In Manila, they are acquiring an increasing monopoly of the name *balangot*, with *bangcoan* as a term of greater precision. In the localities where nearly all of them are made, they are called simply *pandan*. All of these terms have had other uses.

The pandans here considered (*Pandanus utilissimus* Elmer) are large and attain a great age, authentic data giving this up to 70 years for plants still living at the time. The leaves are very long, up to 5 m, and the heads of fruit of great size, weighing 15 to 25 kilos and containing thousands of drupes. The latter are never used for reproduction, as this is easier by means of the abundant suckers which develop at the roots. The leaves are cut for use when the plant is three to five years old and upward, the midrib removed, and the spines along the margin stripped off. The half-leaves are divided into strips with a knife, the use of a guide being necessary, wilted and drawn under a roller or around any other suitable surface.

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[a] This is not the common pandan, except in a limited area, there largely through cultivation. That name should be reserved for *P. tectorius* Soland., as it is not only very much the most abundant in the Philippines, but has a very wide outside distribution, which our other species do not. In addition to Mr. Miller's paper, there is an excellent account of this pandan by M. R (oxas), Philip. Agric. & For. 1 (1911) 11, 12.

In southeastern Luzon, this pandan is replaced by a very similar species, *Pandanus simplex* Merrill, *caragumoy*, from which hats are made at Malilipot, Tabaco, and Bacacay, Albay. They are similar to those just mentioned, but slightly yellower, and serve the same class of trade. My information is that the prices are higher, but I distrust it: if true, this make will not be able to compete with the Laguna products.

BALANGOT HATS.

If any plant more than another is entitled to the name *balangot*, it is *Cyperus malaccensis* Lam., and repeated statements by scores of individuals indicate that this species has been used for both hats and mats up to a comparatively recent date. All the better informed agree that this use has ceased or practically ceased.[36] But the name persists. At any shop (*tienda*) in Manila, where cheap hats are sold, an inquirer is practically certain to be offered *balangot*, but the hat is made from *Pandanus utilissimus*. Many dealers will have a second name for them, namely *bangcoan*. If it be protested that this is not true *balangot*, the dealer looks puzzled, and tries again with buri-leaf, or possibly the coarsest grade of *sabotan*. However, almost as often, he will say that there is no other kind of *balangot*. Very rarely, a dealer will admit that the hat offered is not true *balangot*, but will add that the latter is not used for hats. Again, in provinces as distant as Union and Bohol, it is stated that *balangot* was formerly an inclusive term for all soft hats; where cross-examination has been possible, it further develops that such hats were always cheap. The confusion is of long standing, Blanco laments it in 1837.[37]

The confusion extends to the other and more definite term for the hat now most frequently sold under the name of *balangot*, for the people who make all of those on the market do not seem even to have heard of *bangcoan* at all. Now, this last is very near a name for *Pandanus atrocarpus* Griff., in various dialects from Borneo to Sumatra,[38] *bangkoewang*, for example, requiring only the omission of "oe" to have one of the numerous spellings of the Philippine word. But we seem to have no recent record of this name applied to any other plant than *P.* and for it only at San Antonio, Laguna, where it is wild, at Antipolo, Rizal, where it has been introduced, and for the hats in nearly every place where they are sold, except in the locality where they are made. This Malayan use of the term is significant, and doubtless indicates extreme antiquity, although the effect is somewhat spoiled by the fact that it extends to a leguminous plant in every way dissimilar. No parallel case has been found for *balangot* nor *sabotan*, although there is a town Soputan, in Celebes, where pandans abound.[39] This is suggestive, but no proof has been obtained that there is any connection with the Philippine use, or rather uses of the word.

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[36] See page 105.

[37] Fl. Filip. 777-780.

[38] De Clercq, F. S. A. Nieuw Plantk. Woordenboek Ned. Ind. (1909) 296.

The most probable conclusion is that *balangot* has been an inclusive term for cheap, soft hats, and that these were formerly made largely from *Cyperus malaccensis* Lam., the name being still often retained for that and other sedges, but that now its use has been transferred to the hats made from the pandan already mentioned. As a distinct class of hats, it no longer has any other meaning.

HEMP HATS.

Materials taken from Manila hemp, *abacá* (*Musa textilis* Née), are used for hats in four different ways. The leaves often form the interior part or body of *salacots*. In the schools at Zamboanga, actual hemp is being tested for hat making, with fairly satisfactory results.

In various places, perhaps more in Manila than elsewhere, different qualities, but usually the cheaper, of the cloth woven from hemp, called *sinamay*, plain or more often partly dyed, are cut into strips, and the strips sewn into hats. They would do as a substitute for cloth caps, but they have little in their favor except durability. Such prices as have been encountered are absurdly high, from one peso and ten centavos to two pesos and a half for each hat.

The remaining method is entirely different, but the Philippines merely supply the material for the product. Long, fine strands of the very best grade of hemp are tied end to end and made into coils, weighing a little less than 500 grams. This method of preparation is confined to Batangas. At Wohlen, Switzerland, this hemp and other materials have been used since the introduction of machine-made plaits, braids, laces, and trimmings for ladies' fancy summer hats and other millinery, the change having taken place between 1855 and 1860. Since that time, these materials have largely taken the place of native straw-plait manufacture, which could not meet the competition of China and Japan. The hemp plaits are among the preferred materials as regards length, but are not adapted to bleaching nor are they as smooth as some others. Such materials are cleaned, washed, bleached or dyed, and spun into threads

[39] Sarassin, P. & F. Reisen in Celebes 1 (1905) 69–74, *pl. 3.*

or twisted into yarn, stiffened in a gelatine bath, and sized together into small ribbons, or woven by machines into a lace. From these hats may be made, but they are very different from any Philippine product.

NITO HATS.

The name *nito* is applied indiscriminately to any of the species of *Lygodium*, climbing ferns, common throughout the Philippines, of which at least three have been used for hats. It was one of the first materials employed for this purpose in the Philippines, and its use is no longer general although not discontinued. This product is largely confined to Calasiao and Albay, but with a scattered output elsewhere.

As these hats are made now, the stems of the fern are usually split into three, and made of the requisite thickness and width by the methods used in the locality for the preparation of other materials. They are woven with the original outer surface exposed to view. As this is naturally brown to black, the hats or cigarette-cases made from *nito* are of those colors. They are woven either single or double, alone or alternating with other materials. This latter practice appears to have been commoner in the past than it is now. It now probably is impossible, in Luzon, to buy a *nito* hat for much under two pesos, a fairly good double one would cost about three times as much, the highest grades must be expensive, but they practically never get on the market. These last may be very beautiful, few hats equalling in this respect some which were among the exhibits at Madrid, in 1887, and are now in the Museum of the Bureau of Science. These may well be compared with the better grades of rattan. The ordinary grades of *nito* are well adapted to use by such persons as prefer hats of naturally dark color, and it is possible that the trade might be revived with some success. There is a persistent story that the very best hats of Calasiao are made of white *nito*, but very well-informed workers there neither knew of this, nor could they obtain any confirmation of the report. Still, the stem of *Lygodium circinnatum*, the species used there, is sometimes in part of light color. In the Visayas, *nito* hats are cheaper than in Luzon, but usually of much poorer quality.

Formerly also, entire stems of *nito* were employed in an open weave, called *linca*. I have only seen one hat of this kind, and it was over 25 years old. Its general appearance can be judged from the fact that it took several persons to convince me that it was not a *buntal*, that had in some way acquired a dark color.

TICOG OR TAYOCTAYOC HATS.

While the sedge *Fimbristylis utilis* Elmer is widely distributed from at least the east coast of Luzon to Mindanao, it is in the Visayas that it has its greatest economic importance. Basey, in Samar, has the widest reputation for its use and especially for mats made from it, but the work extends as far as Panay. In Bohol, hats and mats are made from it in

Talibon, but they are also on sale in other places, from which they are sometimes said to come. The mature stems are dried, and flattened by drawing over a knife, piece of wood, or even the fingers. For some fine white mats, they are put in hot water before drying; after drying, they are often dyed. The hats are very cheap, about 12 or 15 centavos each, have when new a good appearance, and seem likely to be durable. The color is usually distinctly green, and as it is due to chlorophyll, is certain to fade. Bleached, both hats and mats have much of promise, but care will have to be taken not to exhaust the supply of material.

MATERIALS OF MINOR IMPORTANCE.

None of the materials remaining to be mentioned have at present any real importance; moreover, it is highly improbable that any of these will ever attain commercial standing. However, this is not to be understood as implying that there are no other plants likely to be used in quantity, for there are several, at present not employed at all, which have distinct possibilities. For instance, the true Panama-hat plant, *Carludovica palmata* Cav. has been introduced, and is making fairly satisfactory growth, but the individuals are too few and too young to permit any statement with regard to their possibilities when grown in this climate. Again, the very minor part played by the *Cyperaçeae*, as compared with that in a country so near as Formosa, or as in Madagascar, is rather significant, although the evidence seems to be that the commoner species have had a trial and been rejected as inferior to others, the majority of which can be obtained in sufficient quantity for a greatly extended trade. *Ticog* alone has any importance in this family at present, and that in islands where bamboo and buri are comparatively little used. It is possible that some of the rarer *Cyperaceae* may be highly useful, but their qualities must first be ascertained, and the plants cultivated on a large scale before they can have any appreciable influence on the trade.

Hawaiian hats are highly esteemed, and the species from which they are made is very abundant along almost every coast of the Philippines, but it seems to be very rarely used, the only very definite report obtained to this effect being from a small island off the southern coast of Mindoro, and that from the people of another place. Negative statements are very numerous.

In one town, San Miguel de Mayumo, Bulacan, the people have a tendency to make hats, which can hardly be described in other terms than as freaks, some of them pretty enough. They have even tried shavings of *palo de China,* wood, mostly pine, taken from packing-cases, obtained in Manila or elsewhere. Anything like this is worthless, unless as a mere curiosity.

Among the commoner vegetables in the Islands is *patola, Luffa cylindrica* (Linn.) Roemer: it has much the appearance of an elongated cucumber, belongs to the same family, and is used in nearly the same way, cooked. Lining the inner surface of this vegetable and penetrating the softer parts, is a network of fibrous substances, particularly evident in the wild varieties, more often distinguished by the name *tambubo* or *tabuboc*. This is dried, and while retaining its shape, is used for sponges; pressed flat, it is sometimes cut into strips, which are sewed together into hats of a yellowish-brown color. These are made in Manila, San Miguel de Mayumo, and other places, they are few in number, and the price is mainly a question of barter, but is likely to be at least two pesos per hat. As hats, these do little more than to cover the head, the work being so open that they afford but slight protection. Usually they are entirely of the one material, the strips being more or less doubled or multiplied at the edges, with a mere band of cotton inside in contact with the head. San Miguel de Mayumo also exhibited at the Carnival of 1910 a hat made of the wood of "acacia," *Enterolobium saman* (Willd.) Prain, lined with this *tabuboc* and cotton.

The prettiest hats of this class are made from the bast of a species not definitely ascertained, but probably belonging to the family *Sterculiaceae*. These are credited both to Bulacan and Ilocos Norte. They can fairly be described as pretty, and would make a nice curiosity, but there is no particular reason why for such purposes, they should be woven into the shape of hats, although such hats are well calculated to attract attention to the wearer during their probably short life.

Yet another gourd, *upo, Lagenaria vulgaris* Ser., is sometimes used, but while the result is often called a hat, it would better come under the head of *salacot*. In effect, it is much what a pumpkin would be if cut in two, cleaned, dried, and variously ornamented.

STRAW HATS.

This term, for which the Spanish equivalent *paja* is in more common use here, is employed in this paper not only for hats made of cereal straw, but for all others of similar shape, with stiff, flat brims and crowns. The distinction is not at all fundamental, for it is becoming common for hats of Calasiao, bamboo, buri-leaf, and *buntal* to be used as the outer covering over a stiffer framework. This is a comparatively recent departure in the Philippines, although not at all new for Philippine hats after export. Such hats, although nearly always of the cheaper grades of the materials above named, have a very good appearance, and are rapidly becoming important for local use, at prices from 2 to 8 pesos each. It is highly improbable that they can be exported in such a way as to compete with factory-made hats elsewhere, unless they can be produced under equivalent conditions, and at a much lower price than at present. Their local use is sure to increase.

A very high percentage of the straw hats worn in the Islands is made at a factory in Manila, but from imported materials. Yet others are imported as a finished product. Among those manufactured in Manila from imported straw were some of the so-called *timsim* hats,[40] which have a native counterpart in those made from *moras*, *Andropogon zizanioides*. They furnish a fairly attractive article, and may supply a part of the local trade. *Paqué* hats are of straw-hat shape, but the covering is quilted cotton. In Manila, this cotton is imported, in Ilocos, native cotton is said to be used.

SALACOTS.

From an American or European point of view, these are quite distinct from hats, but they are by no means peculiar to the Philippines. Their use in these Islands and in Malaya in general, probably goes back many centuries before the introduction of the more ordinary type of hats. They might more nearly be likened to helmets, but are different from them also. They are of many grades of excellence and price, the two sometimes corresponding to one another. The species of plants used are more various than for hats, and there is probably no case where the entire *salacot* is made of a single material. The *salacots* are stiff, so that their shape is often typical of some locality. They are admirably adapted to the two primitive purposes of head coverings, shelter from sun and rain. However, their use is becoming less general, and this tendency will probably be accelerated. They are still extensively worn throughout the Archipelago, least perhaps among the Moros and some of the wild tribes. It is quite without the purpose of this paper to treat them in detail, as so many matters of ethnologic interest enter into their discussion. The Ilocano name is *callogong* or less often *cattocong*.

A highly developed type of *salacot* consists of four parts, an outer woven covering, a central and more continuous layer, a framework, and an inner woven portion to fit the head. In the simplest types, the first and last of these layers are almost wanting; indeed, some of the very finest *salacots* have been made of tortoise shell, and they too have no outer layer. The outer covering may be very elaborate or very plain, with all intergrades; *nito* is a preferred material for making it, but many others are used. The central layer, the real body of the *salacot*, is made from large leaves or portions of them, of banana, hemp, buri, *anajao*, coconut, breadfruit, or other plants, or layers of wood, of bamboo, betelnut, etc., cloth, or even tarred paper, as happens in one kind in common use near Manila. The framework is of more durable material, usually rattan or bamboo, with adornments of *nito* or other materials. This framework is more often circular in outline and much too large for the head. To render the *salacot* possible to wear, a smaller part is usually woven in beneath, and most often of rattan, roughly resembling a skullcap. The difficulty is sometimes met by using string. The tips are frequently adorned, these ornaments ranging in value and beauty from gold to plugs of wood, the tin cork-covers of äerated water bottles, or glass bottle-stoppers. Prices may be at least as low as 12 centavos per *salacot*, but the chief styles are more often from 50 centavos to 5 pesos, and there are still more expensive kinds. It is not as true now as formerly that they are of great value, except when they have been handed down for considerable periods of time, but some are still highly esteemed.

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[40] See page 105.

MAT MAKING.

So far as the needs of the Philippines are concerned, this is a more important industry than hat making. The houses, except those of people in more comfortable circumstances, do not contain permanent beds; and the floors are more often formed of strips of bamboo. At night, a mat is spread, and with the addition of pillows the bed is complete. When not in use, the mats are rolled up and placed in a corner or elsewhere out of the way. They are thus a necessity everywhere, which can hardly be said to be true of hats, for most women go without them. However, in the Christian provinces, nearly all men wear head coverings, and for these hats have almost entirely replaced *salacots*, except for use by laborers.

The most common name for sleeping mats is *petate*, a Spanish word said to be of Mexican origin: of local names *banig* has the widest vogue. The weaving of *petates* is more generally distributed than that of hats, and in a great many cases the needs of a house are supplied by the women living in it. There are also several towns with a high reputation for their mats, and some of these do quite an extended outside trade. This is rather notably the case with Basey in Samar, with Romblon, and Cagayan Sulu.

Many of the coarser materials used for hats are also employed for mats, indeed there is definite evidence in some cases that it is through the latter that their value for weaving has been discovered. It would clearly be impracticable to use finely divided materials for sleeping mats, not that they would not be of greater beauty and probably of somewhat greater excellence, but the amount of work and consequent high price would be prohibitive.

On the whole, buri-leaf is much the most important material for making sleeping mats and is used throughout the Islands, the strands either pale-greenish or bleached or dyed of various colors. The size varies, but ordinarily the mat is about 2 meters by 1.5 meters. Next in importance are the pandans, especially the two used for hats in Laguna, and the sedge *ticog*, used in the Visayas and Sorsogon. For table mats, bamboo is most often seen, but they might well be made of any of the better materials, buri-midrib would be equally good, *buntal* and rattan better, but the cost would also be greater.

Under present conditions, nearly every returning American, especially those who have lived elsewhere than in Manila, takes with him one or more mats, largely as curiosities. Apart from this, there is little export trade, but there are distinct possibilities, although competition will be severe.

CIGAR-CASES AND CIGARETTE-CASES.

These differ chiefly in size. The Philippines have a long-standing reputation for these articles, locally known as *petacas* or *petaquillas*. Baliuag received a special award for them at the London Exhibition of 1851. They are made in nearly all the towns that do fine hat-work, and the materials used are the same as those for hats, namely rattan, bamboo, buri (midrib and *buntal*), horsehair, and *nito*. They differ in fineness, but less so than hats, as they can not be very coarse, and more often are very fine.

BAGS AND BASKETS.

These also are made in considerable quantity, nearly always of buri-leaf or pandan, and are used for all kinds of purposes, rather special types being the sugar bags and still larger sacks, to both of which the name *bayones* is applied. They are very cheap, even the largest selling down to 10 centavos, prices varying with the locality and the size of the bag. More fancy baskets, of smaller size, and other similar objects, are often woven from bamboo, bamboo and *nito*, *nito*, coconut midribs, and other materials.

GENERAL CONSIDERATIONS.

It is evident that many different materials are used for the purposes given, and that the products are of every degree of excellence. In passing comparative judgments, a sharp distinction should be made between the hats intended for local consumption, for export to tropical countries, or export to temperate climates. Practically, the second of these is confined at present to a fluctuating export of very cheap grades to Hongkong and China, most other tropical countries having more or less similar industries of their own.

For ordinary local use, it is improbable that anything can replace buri-leaf and pandan, as such hats are very cheap, and well adapted to climatic conditions. For those who wish better articles, there are many to choose from, and there is much difference of opinion. Thus, there can be no objection to the statement that rattan furnishes the finest materials and that the hats made from it are very beautiful, but its scarcity and their high price cause them to be rarely seen. *Buntal*, medium and better grades of bamboo, Calasiao, and *sabotan*, are all in fairly common use, and all these are suited to the requirements of the climate except Lucban *buntal*, and that also is good for evening wear by Europeans, or all times of the day by women or Filipinos, who require less protection. Many Americans and Europeans retain their preference for straw hats, and their use is very general with educated Filipinos. In such cases, the appearance of the hats and prices must be considered, and any statement of opinion must be qualified by the fact that there are different grades of all the important materials. Omitting rattan, first place should be given to Baliuag *buntal,* higher grades of Calasiao and *sabotan* coming next. This takes into account appearance, suitability to conditions, and durability, and is based on such grades as should be purchasable for 8 to 12 pesos a hat. On appearance alone, Lucban *buntal* should be added to the list; and near the upper limit of price stated, bamboo is also to be considered. At 4 to 6 pesos each, *sabotan* may be placed first as regards suitability to conditions, Lucban *buntal* for appearance, but on a combination of qualities, the choice would more likely be between Calasiao and bamboo, the last more easily obtained. Below 4 pesos, bamboo is better for wear in the daytime, Lucban *buntal* in the evening.

When export in large quantities is considered, only three kinds need enter into the discussion, bamboo, Lucban *buntal,* and buri-leaf. This statement is made for two reasons, a consideration of the supply and their comparatively low price. For very cheap trade, buri is the only material, and hats of it are exported, but in less quantity than either of the others. *Buntal* is more expensive than the grades of bamboo ordinarily exported, but it has one great advantage. It is an unique product, while bamboo has to meet the severest competition. However, it does meet it, and hats made from it are to-day exported in larger quantity than any other kind, although this preponderance is partly due to the greater producing capacity of Baliuag and Pulilan over Lucban and its neighbors. Moreover, both the bamboo and the buri have a distribution that permits a great extension of the work. As between them, the probability is that the trade will adjust itself naturally. It is even more desirable that the makers should realize the advantage to themselves of changing such details as shape and size at the request of exporters without fining the latter for the concession, also that they should appreciate the importance of more sharply standardizing the grades.

For some years, many Americans in the Philippines have made a practice of sending small quantities of various makes of hats to their home towns or to others where they have business connections. Such trade, so far as the United States is concerned, has usually been profitable, and permits the export of the higher grades, which can rarely be procured in large quantity.

It should be possible to decrease the cost of preparation of the materials, especially of those where division is necessary, by machinery, or without it, by greater division of labor. The weaving could be done more cheaply in factories, and the other existing drawbacks obviated at the same time, but experience except in Manila seems to remove this from the list of possibilities. At present, the Philippines are successfully carrying on an industry of high excellence under primitive conditions.

ACKNOWLEDGMENTS.

In the course of this investigation, I have been under obligation for information to so many persons, that their number alone would make a suitable acknowledgment impossible. But there are some whose aid has been so great, that the omission of public recognition of it would be unpardonable. Among them, I wish particularly to thank Doctor E. B. Copeland, dean of the Agricultural College, Los Baños; Señor Epifanio Ortega, Baliuag; Mrs. J. D. Y. Adams, Tagbilaran, Bohol; Señorita Marina Fernandez, Calasiao; Señor Getulio Vitasa, Majaijai; Mr. M. M. Saleeby, fiber expert, Bureau of Agriculture; Señorita Petrona Estrellado, Luisiana; Messrs. H. M. Curran and E. E. Schneider, Forestry Bureau; and Mr. A. D. E. Elmer, Manila. In the Bureau of Science, probably at least half of its members have assisted me in one way or another, and outside of it, the number runs far into the hundreds.

For much valuable information regarding the industry in other countries, I am indebted to Doctor Hans Schinz, Zurich, Switzerland; M. Emanuel Isler, Wohlen, Switzerland; the Director of Agriculture, Buitenzorg, Java; Mr. B. S. Rairden, American consul, Batavia, Java; Mr. Carl C. Hansen, American vice- and deputy consul-general in charge, Bangkok, Siam; and Mr. Takiya Kawakami, Taihoku, Formosa.

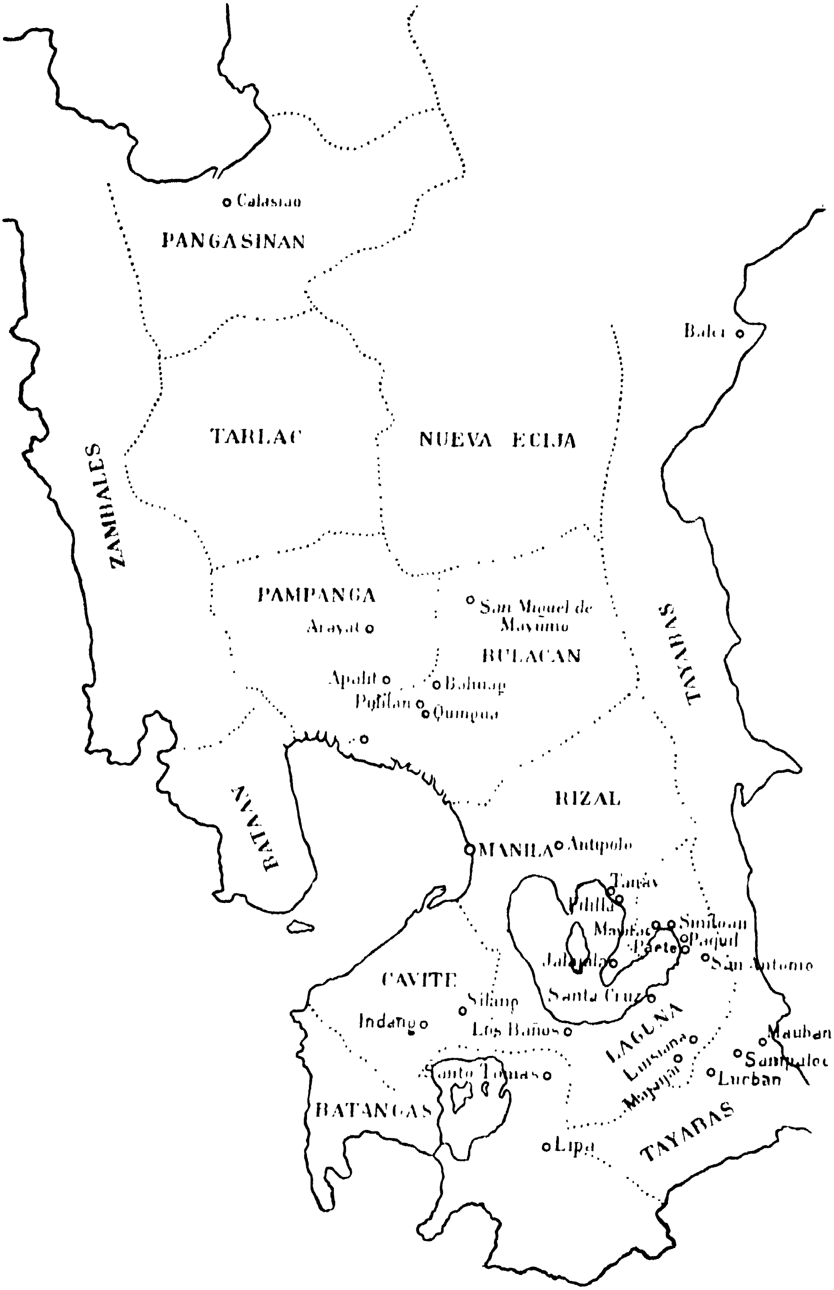
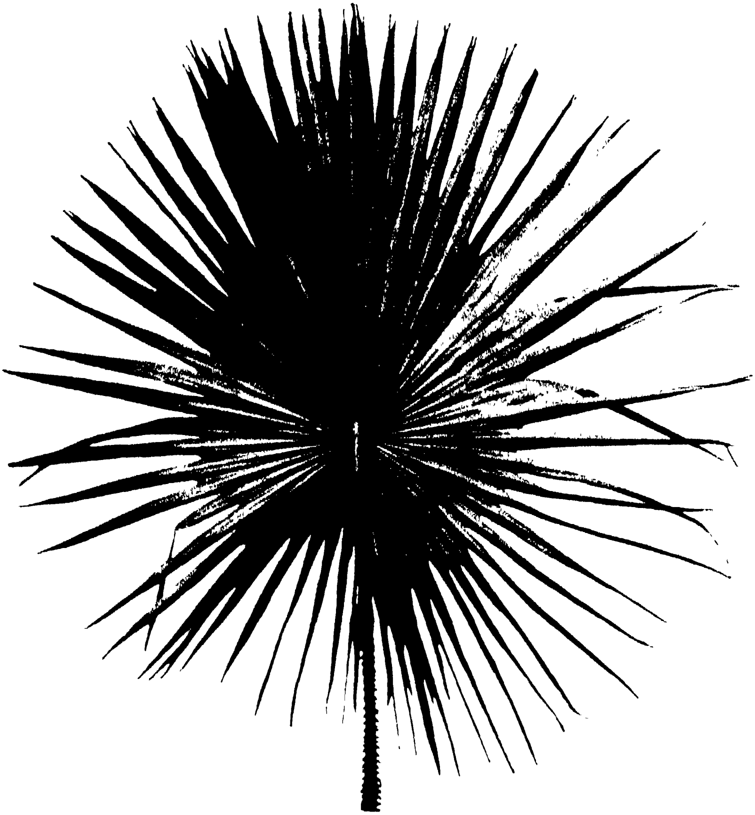
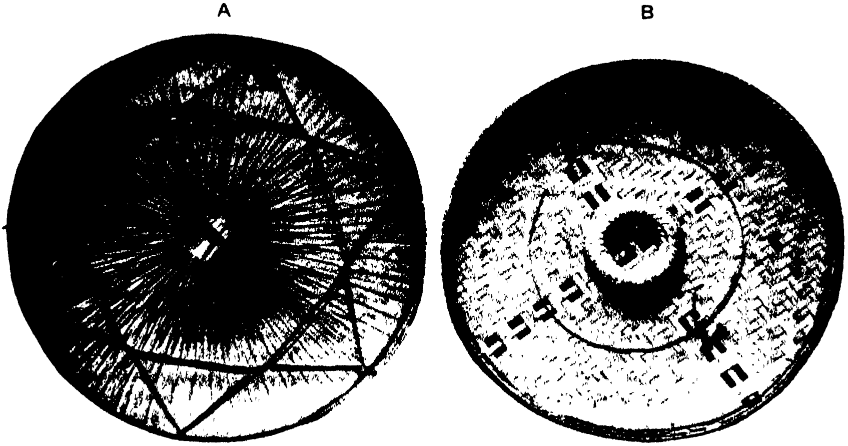


PLATE IV. MAP OF CENTRAL LUZON, SHOWING AMONG OTHER PLACES THE LOCALITIES CHIEFLY REFERRED TO IN THIS PAPER.

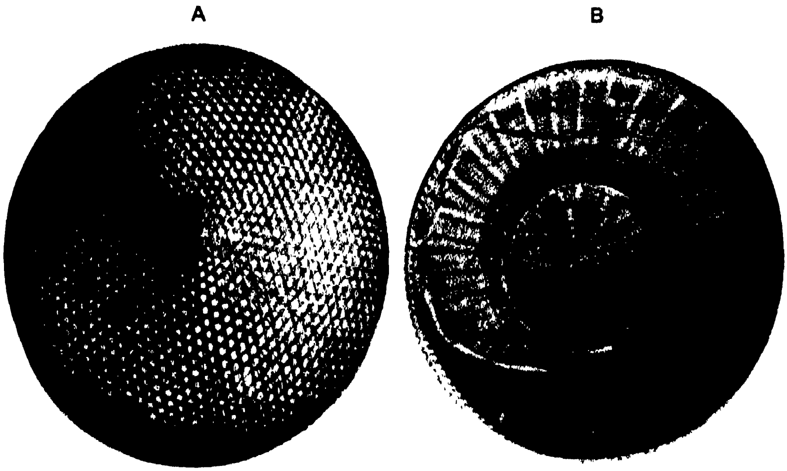


LEAF OF ANAJAO (LIVISTONA SP.)

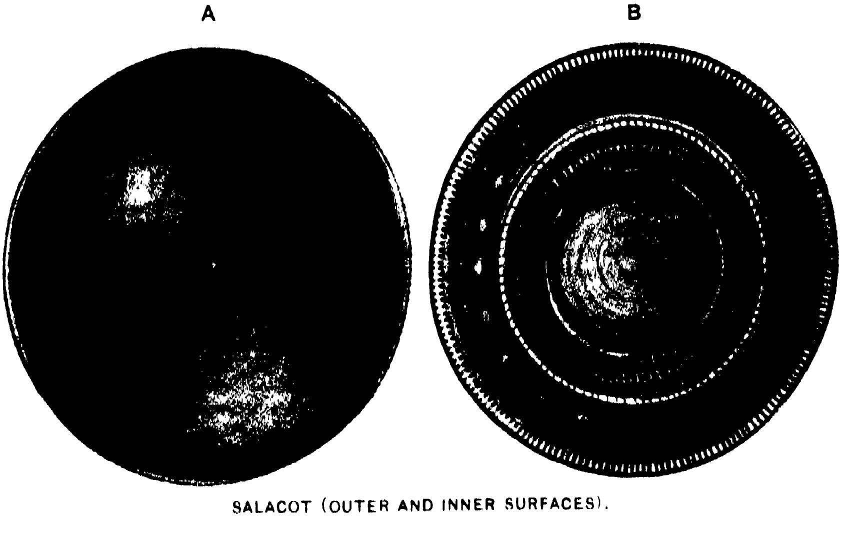


SALACOT (OUTER AND INNER SURFACES).

PLATE V.



SALACOT (OUTER AND INNER SURFACES).



SALACOT (OUTER AND INNER SURFACES).

PLATE VI.

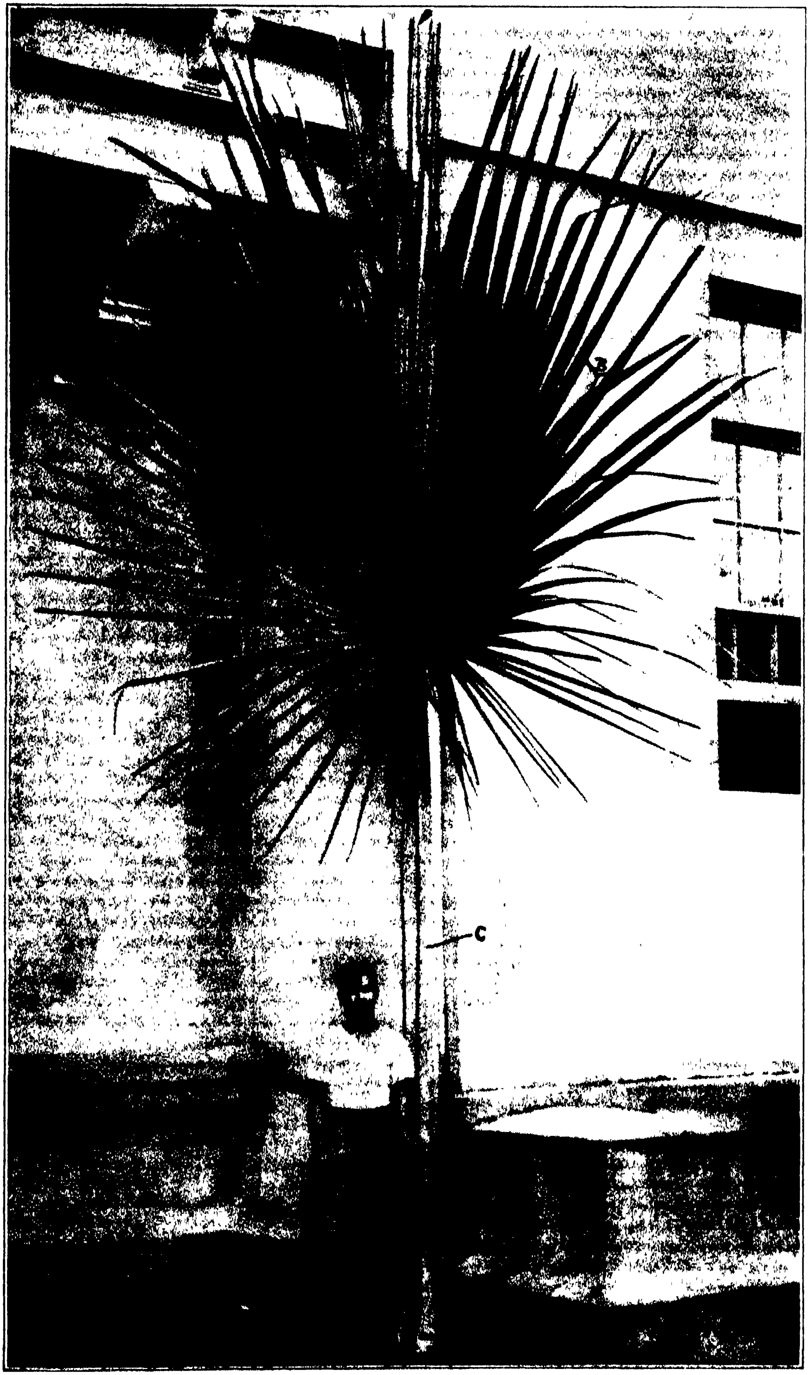


PLATE VIII. LEAF OF BURI PALM (CORYPHA SP.).

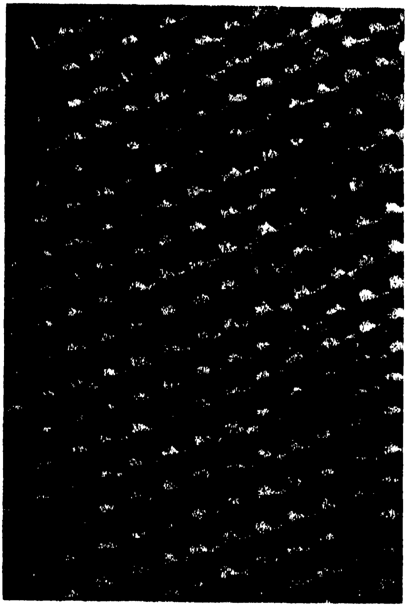


FIG. 1. BUNTAL (LUCHAN).

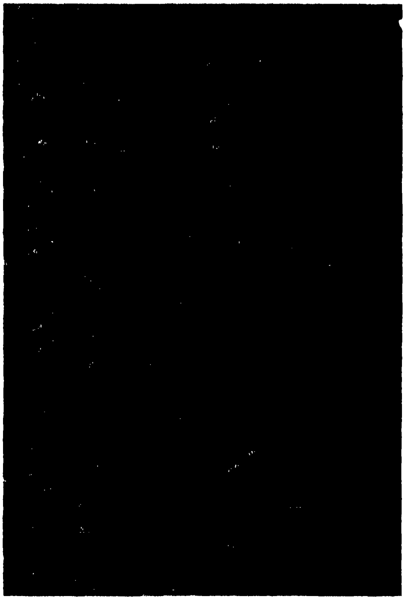


FIG. 2. BUNTAL (BALIUAG).

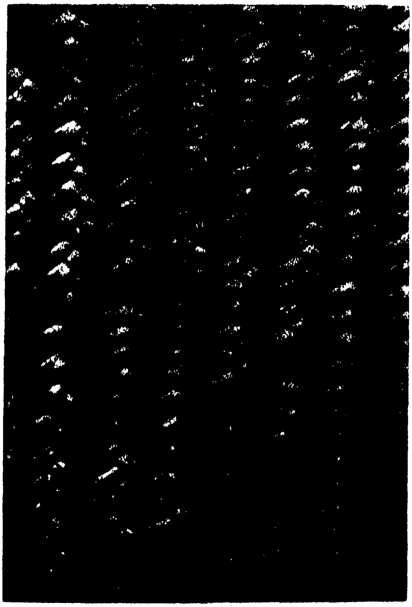


FIG. 3. BAMBOO.

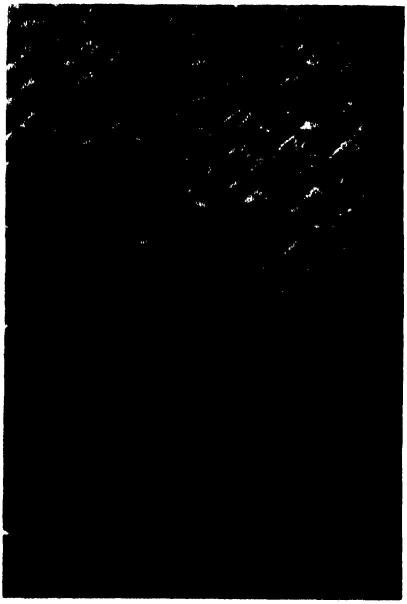


FIG. 4. CALASIAO.

PLATE IX. PORTIONS OF PHILIPPINE HATS MAGNIFIED 4 DIAMETERS.

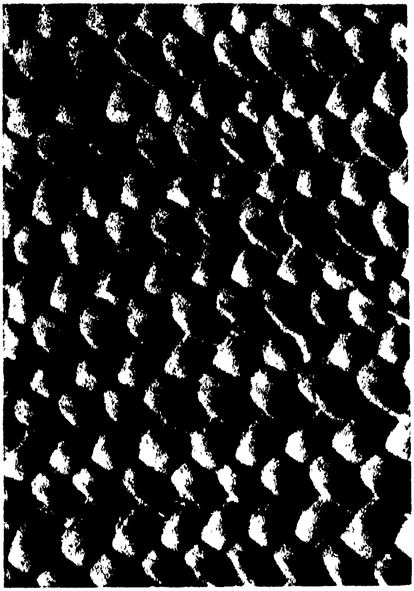


FIG. 1. SABUTAN.

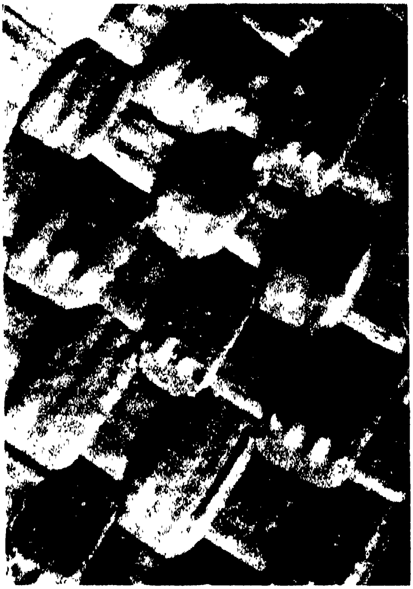


FIG. 2. PANDANUS UTILISSIMUS.

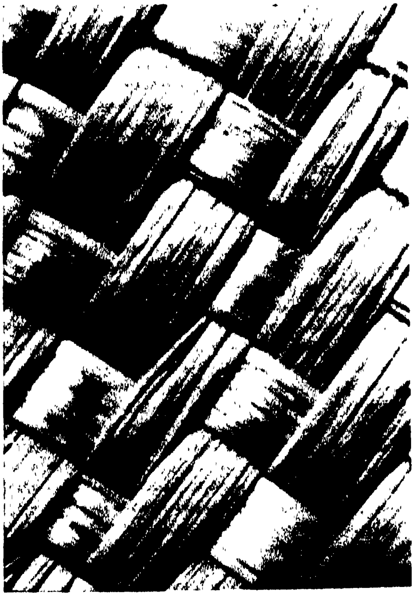


FIG. 3. TIKOG.

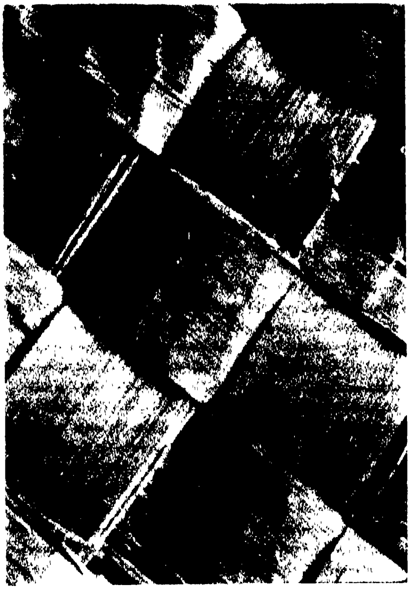
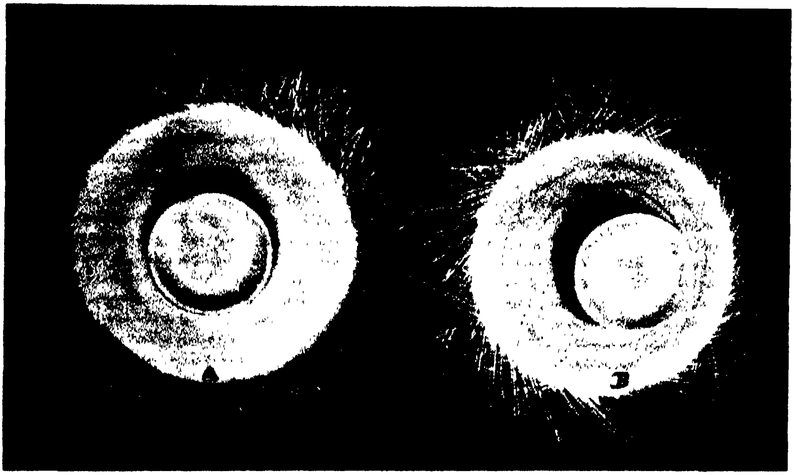
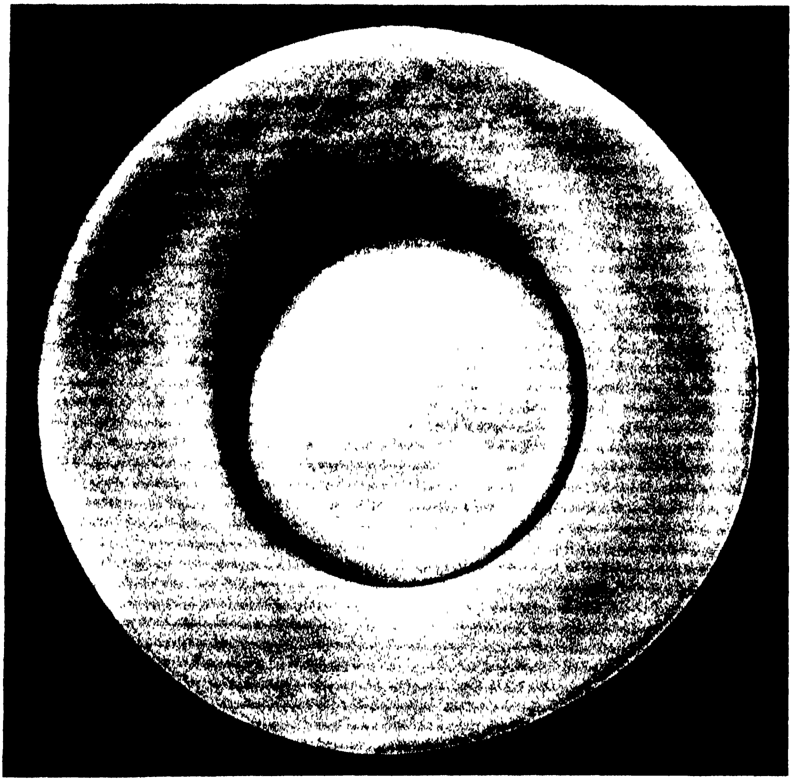


FIG. 4. BURI LEAF.

PLATE X. PORTIONS OF PHILIPPINE HATS, MAGNIFIED 4 DIAMETERS.



OUTER AND INNER HALVES OF ONE CALASIAO HAT.



COMPLETED BURI-MIDRIB (CALASIAO) HAT.

PLATE XI.

THE PHILIPPINE

JOURNAL OF SCIENCE

C. BOTANY

VOL. VI JULY, 1911 No. 3

BORNEAN FERNS COLLECTED BY C. J. BROOKS.

By EDWIN BINGHAM COPELAND.

(*From the College of Agriculture, Los Baños, P. I.*)

During the past few years, I have received a number of very interesting collections of Bornean ferns, part of them from Mr. C. J. Brooks, Resident of Bidi, Sarawak, part from the Sarawak Museum. Two papers on these ferns have already been published.[1] Additional novelties from Mr. Brooks' collections are presented in the following pages. It is indeed a pleasure to work on ferns so amply collected as are most of these, and in *Cyathea* this advantage is especially great.

Angiopteris Brooksii Copel. spec. nova. Plate XII. A.

Rhachi terete, glabra; pinnae rhachi 50 cm longa, terete, glabra; pinnulis majoribus ultra 20 cm longis, 2 cm latis, stipitatis, superioribus basi inaequalibus utroque latere rotundato-truncatis, fere integris, cauda 10–15 mm longa serrata terminatis, coriaceis, glabris, viridibus, costa supra depressa infra prominente; venis sat conspicuis, opacis, venulis recurrentibus nullis; soris marginalibus, sporangiis 9–11, facie dorsale fere atra, ventrale brunnea, indusio inconspicuo.

Bau, Sarawak, *Brooks s. n.*

Readily distinguishable from other species without false veins by the stalked coriaceous, entire pinnules, and marginal fructification.

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[1] *This Journal* 3 (1908) Bot. 343–349, *pl. 1–8;* 5 (1910) Bot.

Angiopteris ferox Copel. spec. nova. Plate XII. B.

Stipite rhachique setis 10–15 mm longis atrofuscis duris obsitis; pinna 70 cm longa, rhachi deorsum setis minoribus sparsius vestita; pinnulis utroque latere ca. 30, brevistipitatis, basi more A. evectae inaequalibus, infimis diminutis, medialibus 16 cm longis, 2 cm latis, apice acuminato leviter serrato, aliter ubique minute dentatis, coriaceis, costa utrinque prominente, nigra, infra praecipue deorsum squamulifera; venis conspicuis, pellucidis; venulis recurrentibus opacis, fere ad costam protensis; soris plerumque contiguis, ca. 0.7 mm a margine remotis, sporangiis 7–9.

Penrissen mountain, alt. 1,000–1,200 m, common, *Brooks 26*.

"An enormous fern. The peculiarly hairy stipe and rachis give it a most bizarre appearance." These parts are unknown on a large part of the species of *Angiopteris*; but this one has good distinguishing characters in the single pinnules. These are in form like those of typical *A. evecta* (as represented by DeVriese); but the sori are much closer to the margin; the latter is rather sharply toothed to the base; the false veins are opaque, and the constriction below the apex of the pinnule is less abrupt. *A. similis* has the venation almost invisible by reflected light.

Cyathea arthropoda Copel. spec. nova. Plate XIII.

Stipite ad basin paleis stramineis 5–8 mm longis vestito, aliter glabro, inerme, fere 40 cm alto; fronde 50–60 cm alta, 20–25 cm lata, pinnata; pedicellis pinnarum 1 cm longis, ad rhachin articulatis; pinnis usque ad 15 cm longis, 25–30 mm latis, basi cuneatis, valde acuminatis, integris vel leviter crenatis, papyraceis, glabris; soris 1–3-seriatis, parvis; indusio fugace.

Sarawak, Bungo Range, *Brooks 8*, April, 1909.

Different from *C. moluccana* in the relatively short and broad deciduous pinnae narrowed to the base, and long pedicels.

Mr. Brooks has also sent me a very large form of *C. moluccana*, collected at Bidi in August, 1907.

Cyathea Hewittii Copel. spec. nova. Plate XIV.

C. gregis C. glabrae (Blume) frondibus dimorphis; stipite ad basin paleis fuscis integris 8 mm longis vestito et foliolis in spinis reductis armato, aliter glabro, fere inerme, atropurpureo, 50 cm alto; fronde glabra, bipinnata; pinnis stipitatis 35 cm longis, pinnulis stipitatis, acutis, frondis sterilis usque ad 6 cm longis, 16 mm latis, infimis profunde, aliis levius incisis, lobis crenatis, falcato-rotundatis, subcoriaceis, fertilis, usque ad 4 cm longis et 6 mm latis, lobis triangularibus, soris multis, parvis, costularibus vel more C. glabrae deorsum divaricatis.

Sarawak, Bongo mountain, *Brooks and Hewitt 21*.

A most distinct species, although its affinities are clear.

Cyathea recommutata Copel.

Sarawak, Penrissen mountain, alt. 1,100 m, *C. J. Brooks 60*.

The species is founded on *Cuming 396*, from Malacca, and is reported from Batjan by Christ.

The pinnae of Brooks' specimen are exactly like Cuming's; but Brooks' specimen includes also the base of the rachis, which bears leaflets the pinnules of which are deciduous, leaving sharp spines, in one instance branched. I suspect that this is also *Alsophila ramispina* Hooker.

Cyathea paraphysata Copel. spec. nova. Plate XV.

Stipite ad basin supra paleis fuscis lanceolatis, integris, usque ad 16 mm longis, acutis, et aliis minoribus vestito, sursum nudo, fere inerme, fusco, sicco 8 mm crasso, 40 cm alto; rhachi supra minute velutina; pinnis medialibus maximis, 40 cm longis, brevi-stipitatis, acuminatis, rhachi supra ut frondis, infra minute puberula; pinnulis sessilibus, obtusis, 6–7 cm longis, 14 mm latis, ultra mediam laminam pinnatifidis, costa supra velutina, infra basin versus minute squamulacea; lobis integris, obtusis, falcatis, 3 mm latis, subcoriaceis, lamina glabra, infra pallida, costula infra paleis paucis minutis bullatis pallidis vestita; venis simplicibus utroque latere 4 vel 5; soris medialibus, exindusiatis, paraphysibus sporangia multo superantibus, trichoideis, haud clavatis.

Sarawak, Penrissen mountain, alt. 150 m. *Brooks 57.*

Near to *C. squamulata* (Bl.) but having long paraphyses, and to *C. obscura* (Scort.) but the basal scales entire; and differing from both in the mostly blunt pinnules.

Cyathea (Alsophila) Brooksii Copel. spec. nova. Plate XVI.

Trunco 1 m alto; stipite ca. 45 cm alto, purpureo-nigro, praecipue basin versus paleis stramineis minute nigro-ciliatis anguste lanceolatis aciculatis duris dense vestito; fronde ca. 75 cm alta, vix 60 cm lata, ovata, rhachi deorsum ut stipite, sursum pallida supra velutina infra glabrescente; pinnis medialibus maximis, 30 cm longis, 10 cm latis, subsessilibus, acuminatis, rhachi anguste alata; pinnulis subsessilibus, proximis, basi truncatis, obtusis, 15 mm latis, vix ad mediam laminam incisis; lobis proximis, valde falcatis, late oblongis, integris, papyraceis, lamina glabra; costa supra sparse pilosa infra fere glabra; costulis infra squamulis bullatis minutis deciduis albis ornatis; venis utroque latere 4–6, plerisque simplicibus; soris medialibus, exindusiatis, paraphysibus multis, trichoideis, haud clavatis nec multo ultra sporangia protensis.

Sarawak, Penrissen mountain, from 900 m to the summit, common. *Brooks 59.*

A relative of *C. obscura* (Scort.) from which it is sharply distinguished by the falcate lobes. The point of the lobe usually receives the uppermost acroscopic vein, instead of the apex of the costule; the two forks of a veinlet sometimes unite again.

This is distinguished from the group of *C. glabra* by the numerous pale scales on the stipe.

Cyathea borneensis Copel. spec. nova.

Stipite fusco, nitido, spinoso, ad basin paleis rigidis nitidis atro-fuscis 1 mm latis, 10–13 mm longis vestito; rhachi aspera, supra indumento minuto et paleis sparsis deciduis linearibus fuscis vestita; pinnis medialibus fere 60 cm longis, sessilibus, acuminatis, rhachibus infra sparse pustulosis, supra ut rhachi frondis; pinnulis subsessilibus, 10 cm longis, 2 cm latis. majoribus acuminatis, ad alam angustam pinnatifidis, costis supra velutinis, infra sparsissimis squamulis brunneis vestitis; segmentis subfalcatis, obtusis, integris, 3–4 mm latis, coriaceis, infra pallidis, costis supra glabris infra rarius squamuliferis; venis utroque 8–10, plerisque furcatis; soris costularibus, indusio in fronde visa patelliforme.

Sarawak, Penrissen mountain, alt. 1,100 m, *Brooks 58*.

Very near *C. lanaensis* Christ, but much larger in all parts, and less scaly.

Balantium Copelandi Christ.

Penrissen mountain, alt. 1,200 m, *Brooks 23*.

Only one plant in very exposed situation on landslide.

Previously known only from the Philippines.

Dryopteris paucisora Copel. spec. nova.

Lastraea gregis D. intermediae (Bl.) O. K., qua fronde haud deltoidea, paleis crinitis pallidis et venis glanduliferis differt: stipitibus confertis 3–6 cm altis, paleis angustis crinitis pallide brunneis horizontalibus usque ad 3 mm longis et aliis minutissimis vestitis; fronde ca. 12 cm alta, 3–4 cm lata, lanceolata, rhachi ut stipite, paleis sursum decrescentibus; pinnis infimis deflexis, quam sequentes paullo brevioribus, segmentis basalibus liberis; pinnis sequentibus subsessilibus, oblongis, apice rotundatis, fere ad costam pinnatifidis; segmentis oblongis, obtusis, herbaceis, venis supra setis paucis, infra pilis minutis glandulosis obsitis; venulis simplicibus; soris medialibus, solummodo ad venulam primam acroscopicam impositis, parvis; indusio parvo, ciliato.

Penrissen mountain, alt. 900 m, on vertical rocks in crevices, *Brooks 45*.

In spite of having 6 fertile fronds, this may be a juvenile specimen, but not of any species known to me.

Dryopteris acanthocarpa Copel. spec. nova. Plate XVII.

Rhizomate 4 mm crasso, repente; stipitibus confertis, (frondis fertilis) 35 cm altis, nudis; fronde trifoliata, pinnis lateralibus sat remotis subsessilibus, in axilla bulbiferis, 10 cm longis, fere 5 cm latis, abrupte acuminatis, basi rotundatis, subintegris, glabris, coriaceis, rubidis; pinna terminale 15 cm alta, 8 cm lata, crenata; venulis goniopteroideis; soris inter costam et marginem usque ad 20, subcostularibus, orbicularibus vel ellipticis, exindusiatis; sporangiis spinis validis albis rectis vel subcurvis ornatis.

Penrissen mountain, alt. 900 m, on moist rocks, *Brooks 54*.

A relative of *D. triphylla*, which has narrow pinnae, meniscioid sori, and hooked hairs on the sporangia, and of *D. rubida* which has numerous pinnae and naked sporangia. Those of *D. cuspidata* are also naked.

Dryopteris compacta Copel. spec. nova. Plate XVIII.

Species gregis D. glandulosae (Bl.) O. K., pinnis imbricato-auriculatis facile distinguenda; rhizomate adscendente 5 mm crasso; stipitibus confertis, frondis sterilis ca. 25 cm, fertilis ca. 30 cm altis, basi paleacea excepta glabris; fronde sterile ca. 30 cm alta, 10 cm lata, acuminata, pinnata, rhachi straminea supra velutina, infra glabra; pinnis sessilibus infimis paullo minoribus, deflexis, medialibus horizontalibus, acuminatis, versus apicem acute grosse serratis, basi inferne subcordatis, superne acute auriculatis supra costam imbricatis, papyraceis, glabris; venis anastomosantibus duabus; fronde fertile paullo minore; soris parvis, orbicularibus; indusio persistente piloso.

Bungo Range, *Brooks 4* (Type); Santubong mountain, *Brooks & Hewitt.*

Dryopteris mirabilis Copel. spec. nova. Plate XIX.

Nephrodium gregis D. glandulosae (Bl.) O. K., rhizomate adscendente, 4 mm crasso; stipitibus confertis, frondis sterilis 40 cm, fertilis 55 cm altis, puberulis; frondibus trifoliatis; sterilis, pinna apicale ultra 7 cm, lateralibus 3.5 cm latis sessilibus, subintegris, herbaceis, ad costas dense aliter sparse pubescentibus; fronde fertile paullo minore, crenata; soris paribus, multiseriatis, orbicularibus; indusio pilis albis vestito.

Bidi, *Brooks 16a.*

Tectaria Brooksii Copel. spec. nova. Plate XX. A.

Verisimiliter Polypodium Labrusca in Synopsis Filicum p. 361, non Hooker Sp. Fil. **5**: 73, *t. 285 B.* Collectio Lobbii e speciebus duabus similibus composita videtur, quarum T. Brooksii a T. Labrusca (teste icone Hookeri) paleis basalibus latioribus, fronde minore angustiore, integriore, obscuriore, glabra, soris plus elongatis distincta.

Bidi, on limestone, *Brooks 26a.*

Brooks sends also *T. Labrusca*, No. *26*; plate 109 A, with the following note: "I can not agree that these two specimens are the same, *P. Labrusca*. They commonly occur on the limestone, and often together. They are always distinct. Even very young plants show the same differences in form and texture."

Asplenium Brooksii Copel. spec. nova. Plate XX. B.

Stipitibus confertis, validis, brevibus (1–2 cm longis), paleis angustis usque ad 3.5 mm longis sparsis plerisque adpressis vestitis; fronde ca. 80 cm alta, 10 cm lata, rufo-viride, infra pilis minutis ternatis vestita: vix aliter ab A. amboinense Willd. diversum.

Bau, Sarawak, *Brooks 25*, 1909.

Near *A. amboinense*, but larger and broader, with fewer and smaller scales at the base, spores (in my specimens) more spiny, and distinguished especially by the pubescence of fine, short hairs, borne in threes with a common base. The sori fall slightly short of the margin, but some of them reach the costa. Dedicated to its discoverer, Mr. C. J. Brooks.

Lindsaya nitida Copel. spec. nova. Plate XXI.

Synaphlebium, rhizomate repente, 1.5 mm crasso, paleis minutis vestito; stipitibus haud remotis, ca. 30 cm altis, brunneis, rhachibusque quadrangularibus et profunde sulcatis; fronde visa 15 cm alta, 23 cm lata, bipinnata; pinnis 5, terminale et lateralibus oppositis biparibus, acuminatis, sessilibus; pinnulis sessilibus, ca. 12 mm longis, 5 mm latis basiscopice (sensu frondis) integris, acroscopice integris vel levissime et late incisis, apice rotundatis et soro angusto inframarginale circumdatis, papyraceis, subdiaphanis, glabris supra nitentibus; venis anastomosantibus, areolis longis.

Penrissen mountain, alt. 900 m, *Brooks 12*.

"Fairly common, of constant form." *L. Hewittii* has numerous small pinules, the areolae being, as in other related species, shorter and broader. There is usually but one sorus, rarely another small one in a lobe.

Lindsaya orbiculata (Lam.) Mett. var. **odontosorioides** var. nova.

Fronde lanceolata, pinnulis obcuneatis, plus minus profunde incisis, lobis ca. 1.5 mm latis, venis 2 in soro subapicale confusis.

Tringos, *Brooks 19*, 1909.

This fern is so distinct in appearance that I at first mistook it for an *Odontosoria*. However, its affinity to *L. tenera* Dry. is unmistakably very close, and until the group of *L. orbiculata* can be studied as a whole, with very ample material, it seems better not to try to separate its forms as species.

Adiantum pulcherrimum Copel. spec. nova. Plate XXII.

Adiantellum, stipitibus confertis, atrocastaneis, nitidis, deorsum paleis brunneis angustis vestitis; fronde deltoidea, 25 cm alta, tripinnata, rhachibus supra velutinis; pinnis utroque latere 2 vel 3, superioribus pinnatis inferioribus bipinnatis; pinnulis stipitatis, dimidiatis, apice rotundatis vel truncatis dentatis, acroscopice lobatis, ca. 17 mm longis, 7 mm latis, coriaceis, supra atroviridibus, infra caeruleis; venis liberis, supra sulcatis; soris in apices exsculptos loborum impositis, indusio coriaceo nigro, obreniforme, usque ad 2.2 mm lato.

Penrissen mountain, alt. 1,150 m, on dry sandstone ledge under overhanging rock, *Brooks 2*.

Distinguished from its Malayan relatives by the glaucous nether surface and large, black indusia. *A. affine* Willd. has naked rachises, and *A. fulvum* Raoul segments attenuate at the apex.

Pteris rangiferina Presl.

Penrissen mountain, alt. 1,200 m, on dry sheltered rock, *Brooks 15*.

This is a form with but few pinnae, all simple, the fertile recurved and the sterile very broad; in essentials, however, it is like specimens from Java. From the Javan material in hand, it seems probable that *Pteris Dalhousiae* and *Pteris rangiferina* both exist in Java, but are decidedly distinct.

Taenitis Brooksii Copel. spec. nova. Plate XXIII. A.

Stipitibus confertis, basibus paleis minutis angustis nigris vestitis, aliter glabris, rubidis, 3–4 cm altis; fronde simplice, ca. 8 cm alta, 12 mm lata, basi abrupte cuneata et anguste paullo decurrente, deinde sensim ad apicem angustata, integra, glabra, dura.

Bungo Range, alt. 900 m, *Brooks 3*.

Recognizable by the narrow, acuminate, not cordate, very rigid fronds.

Polypodium sparsipilum Copel. spec. nova. Plate XXIII. B.

Eupolypodium rhizomate paleis brunneis nitidis late lanceolatis 1.5 mm longis dense obtecto; stipitibus confertis, filiformibus 6–9 mm altis, pilis horizontalibus 1.5 mm longis ornatis; fronde ca. 5 cm alta, 3–4 mm lata, subintegra, herbacea, diaphana, pilis sparsissimis vestita; venis plerisque furcatis; soris orbicularibus, subsuperficialibus, subcostalibus.

Bengkarum, alt. 900 m, *Brooks 14*.

This little fern seems to be nearest to *P. trichopodum* F. Mueller, of New Guinea. The veins terminate in hydathodes.

Polypodium setaceum Copel. spec. nova. Plate XXIV.

Eupolypodium rhizomate repente usque ad 2.5 mm crasso, paleis ferrugineis linearibus 2–3 mm longis vestito; frondibus ad ramos breves articulatis, confertis, setaceis, 55 cm et ultra longis, 1.5 mm latis, in stipitem brevem attenuatis, integris, glabris, opacis, costa infra prominente, supra sulcata, lamina utroque latere costae supra convexa, infra concava, venis occultis; soris fere costalibus elongatis.

Tringos, Sarawak river, *Brooks 6*.

This suggests *P. bisulcatum* Hooker, but has the fronds decidedly more slender and very different in cross section, and closely clustered.

THE DRYNARIA GROUP.

There is probably no group of organisms known which are more distinct in appearance but more evidently homogenetic than these are. *Polypodium heracleum* may stand in the place of the parent. By diagnosis and by unquestionable affinity it is a *Polypodium;* or if *Polypodium* be broken up it is still in whatever division contains *P. musaefolium*. But it is no less certainly related to *Drynaria quercifolia*.

The status which shall be given to the individual members of this group, and the size of the minor groups are purely matters of judgment. We may keep all these ferns in one genus, even in *Polypodium*, and find justification enough in their obvious homogeneity—and this is the most important single criterion; or we may recognize one distinct daughter-genus, and include in it *P. heracleum* or leave the latter with its forbears. At the other extreme, we may recognize a considerable number of genera, most of them of a single species each; and these genera will have distinguishing characters as obvious as anyone can reasonably demand. *Polypodium coronans*, *Dryostachyum pilosum*, and the Bornean fern to be described below will each constitute a new genus if this plan be followed.

I have preferred to compromise simplicity of generic characterization with phylogenetic unity, and recognize the following minor groups, which seem to key out approximately along their lines of evolution:

Without distinct humus-collecting leaves.
Fronds borne on the axis of the rhizome.
Sori not coalescing into patches nor borne on specialized segments. **§ *Drynariopsis***
Sori round .... ***P. heracleum***
Sori linear .... ***P. coronans***
Sori composite, but not crossing the main veins, on the upper segments. ***Aglaomorpha***
Sori linear, the length of the upper segments.
Sterile segments confluent .... ***Merinthosorus***
Frond pinnate .... ***Photinopteris***
Fronds borne on specialized branches .... ***Thayeria***
With distinct humus-collecting leaves .... ***Drynaria***

Thayeria as here construed contains species with very distinct fertile leaves. The Luzon plant which I identified specifically with *Polypodium nectariferum* Beccari of New Guinea, turns out to have fertile leaf-apices like *Aglaomorpha meyeniana*, making it even generically distinct if one be disposed to carry the separation to at all a fine point. For the present, however, the fertile frond of *T. Cornucopia* of Mindanao is unknown, and it is the type of its genus.

AGLAOMORPHA Schott emend.

Genus Polypodiearum ex affinitate Polypodii (Drynariopsidis) heraclei derivatum, frondibus rhizomate ipso ortis non vel imperfecte articulatis, sterilibus uniformibus, venatione Drynarii, soris ad partem apicalem frondis restrictis, compositis.

The genus was described by Schott in 1834 to contain the single species *A. meyeniana*, and is identical with *Psygmium* Presl, 1836. In 1841 Smith proposed the genus *Dryostachyum* for two related species, *D. splendens* and *D. pilosum*, which have generally been confused, but are very distinct. *Dryostachyum* and *Aglaomorpha* differ only in that the lamina of the fertile segments of the latter is more reduced. By itself I do not regard this as a sufficient generic character unless its recognition will result in very great convenience.

If one be disposed to unite this whole group in one genus, *Aglaomorpha* is its oldest generic name, *Drynaria* not having been used in that sense until seven years later.

Sori forming several rows .... **§ *Hemistachyum***
Sori forming one row on each side of costa.
Lamina of fertile segments continuous .... **§ *Dryostachyum***
Lamina cut away between sori .... **§ *Psygmium***

§ HEMISTACHYUM.

Soris compositis, inter costam et marginem pluribus.

1. **A. Brooksii** Copel. spec. nova. Plate XXV.

Fronde ca. 120 cm alta, ad basin sicca, 35 cm lata, humifera, articulatione vestigiale, parte apicale 25 cm alta solummodo pinnata fertile; pinnis fertilibus usque ad 18 cm longis, 15 mm vel ultra latis, apud rhachin dilatatis, soris compositis, inter costam et marginem 3 vel 4, inter venas 2 aut per coalescentiam 1.

Sarawak, Penrissen mountain, alt. up to 900 m, common but seldom fertile. *Brooks 39* (Type); Benkarum mountain, on summit, *Brooks 37*. The latter is the plant mentioned in a former paper, Philip. Journ. Sci. **5** (1910) Bot. 285, as an apparent hybrid between *P. heracleum* and *Dryostachyum splendens*.

This is clearly the most primitive known *Aglaomorpha*, and the specialization of its fertile segments is neither very great nor very firmly fixed. The type has, below the strictly fertile segments, one with a fertile tip; and the Bengkarum specimen has only two fertile segments, which are a little below the apex. The whole group is a very new one, and I have individuals of each of the other species of the genus, in which the distinction between fertile and sterile segments is more or less broken down.

§ DRYOSTACHYUM.

2. **A. splendens** (J. Sm.) Copel. comb. nova.

Dryostachyum splendens J. Sm. Journ. Bot. **3** (1841) 399.

Bot. **3** (1841) 399.

This species has very large, usually squarish sori, and a dilated humus-collecting base.

3. **A. pilosa** (J. Sm.) Copel. comb. nova.

Dryostachyum pilosum J. Sm., Journ. Bot. **3** (1841) 399 *nomen*.

Base of leaves narrowed to a stipe, and not collecting humus. Scattered fertile segments are not at all rare. In the absence of the humiferous base, in the instability of the localization of fertile segments, and in the slender rhizome, this species resembles *Polypodium* species less specialized and more primitive than *P. heracleum* and *P. coronans*; however I am of the opinion that this resemblance is not proof of near affinity, and that *A. pilosa* is a simplified descendant of humus-collecting species. Another possibility is that it is a hybrid of *A. splendens* and *Photinopteris speciosa*.

§ PSYGMIUM.

4. **A. meyeniana** Schott.

The type of the genus.

ILLUSTRATIONS.

(Photographs by Charles Martin, Bureau of Science.)

PLATE XII. *a*, Angiopteris Brooksii. *b*, Angiopteris ferox.
XIII. Cyathea arthrópoda.
XIV. Cyathea Hewittii.
XV. Cyathea paraphysata.
XVI. Cyathea Brooksii.
XVII. Dryopteris acanthocarpa.
XVIII. Dryopteris compacta.
XIX. Dryopteris mirabilis.
XX. *a*, Tectaria Labrusca. *b*, Tectaria Brooksii.
XXI. Lindsaya nitida.
XXII. Adiantum pulcherrimum.
XXIII. *a*, Taenitis Brooksii. *b*, Polypodium sparsipilum.
XXIV. Polypodium setaceum.
XXV. Aglaomorpha Brooksii.

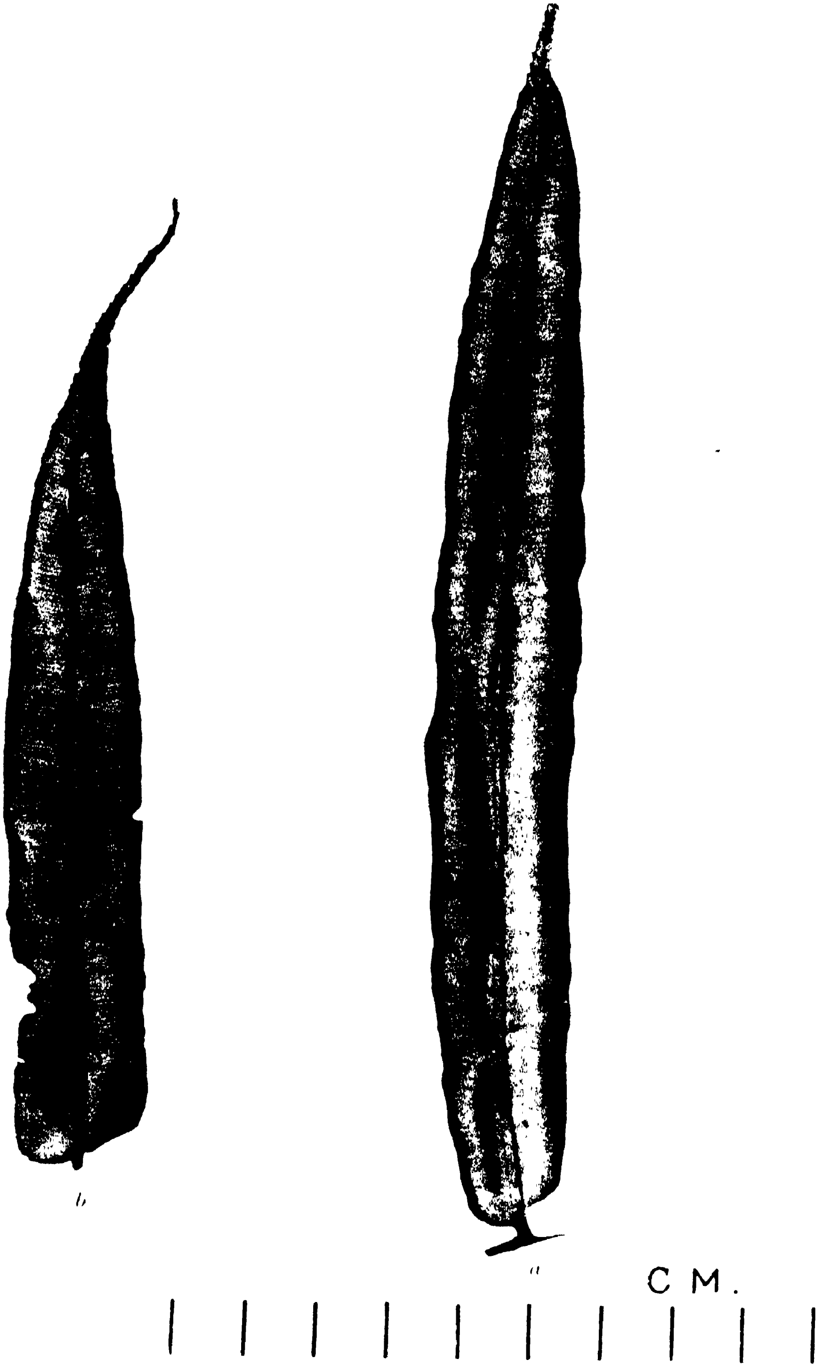

PLATE XII. a, ANGIOPTERIS BROOKSII. b, ANGIOPTERIS FEROX.

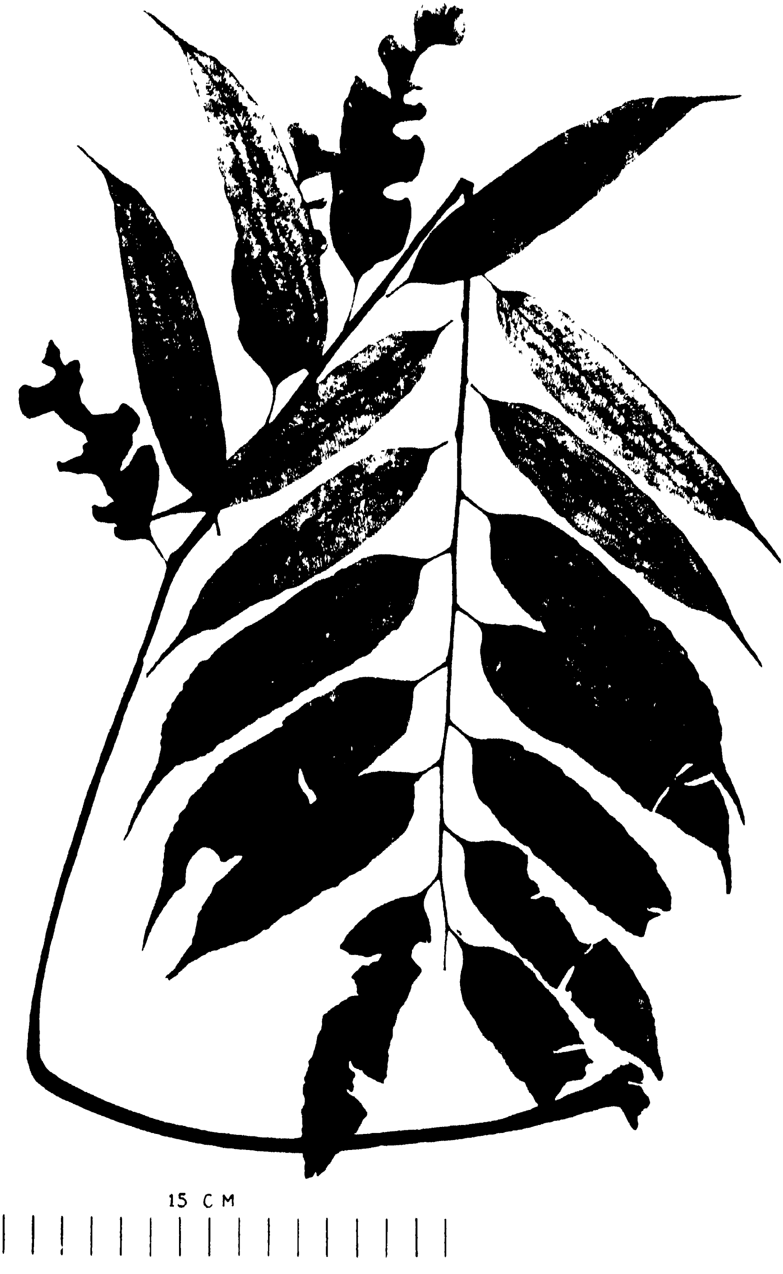

PLATE XIII. CYATHEA ARTHROPODA.

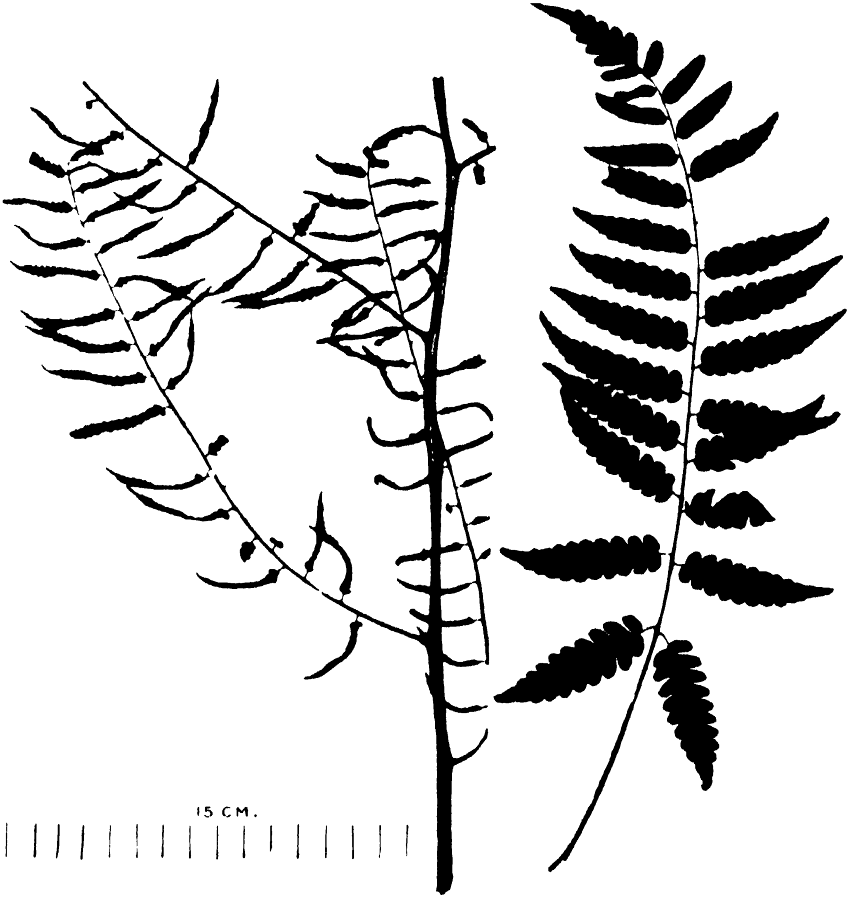

PLATE XIV. CYATHEA HEWITTII.

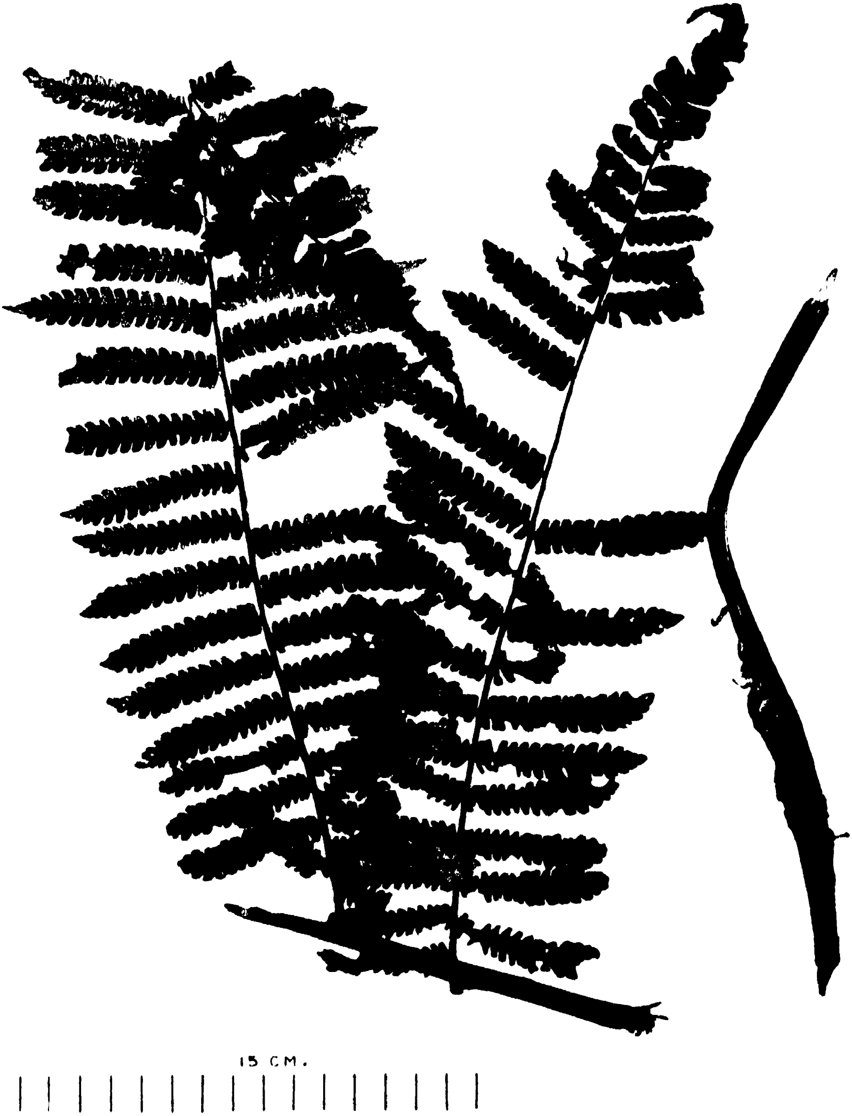

PLATE XV. CYATHEA PARAPHYSATA.

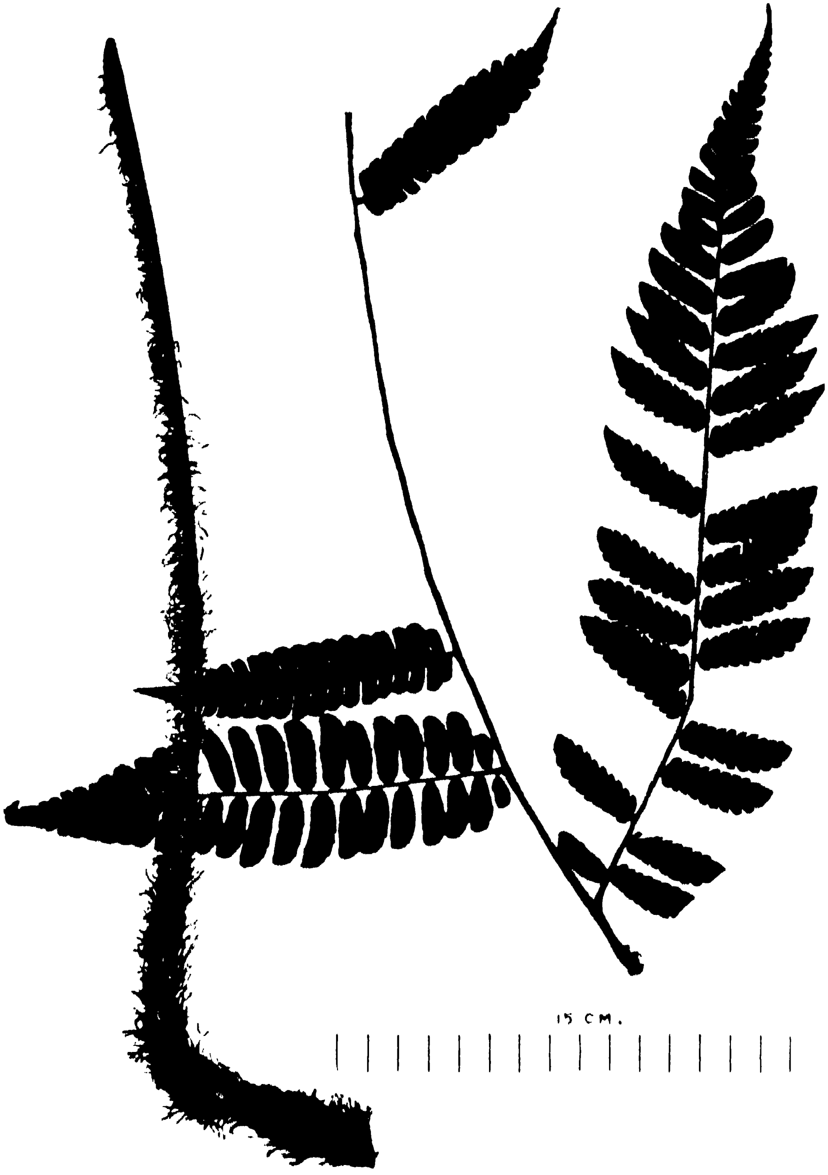

PLATE XVI. CYATHEA BROOKSII.

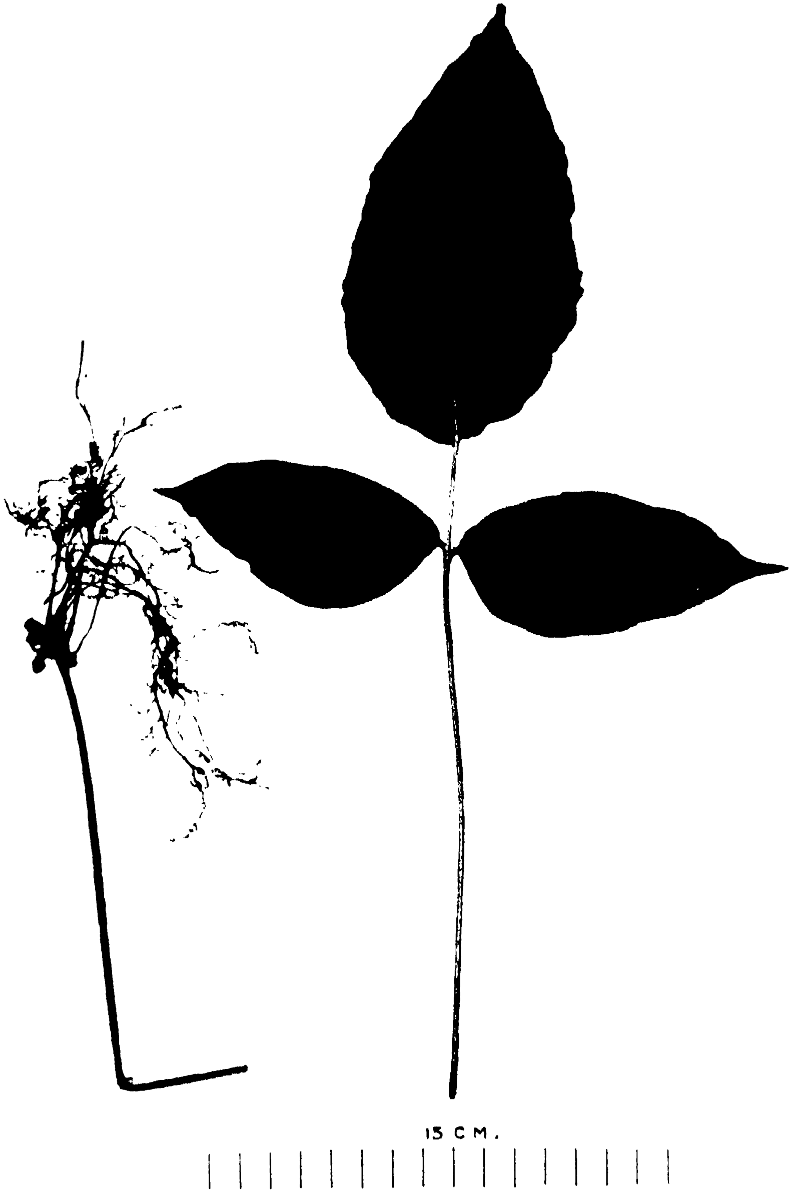

PLATE XVII. DRYOPTERIS ACANTHOCARPA.

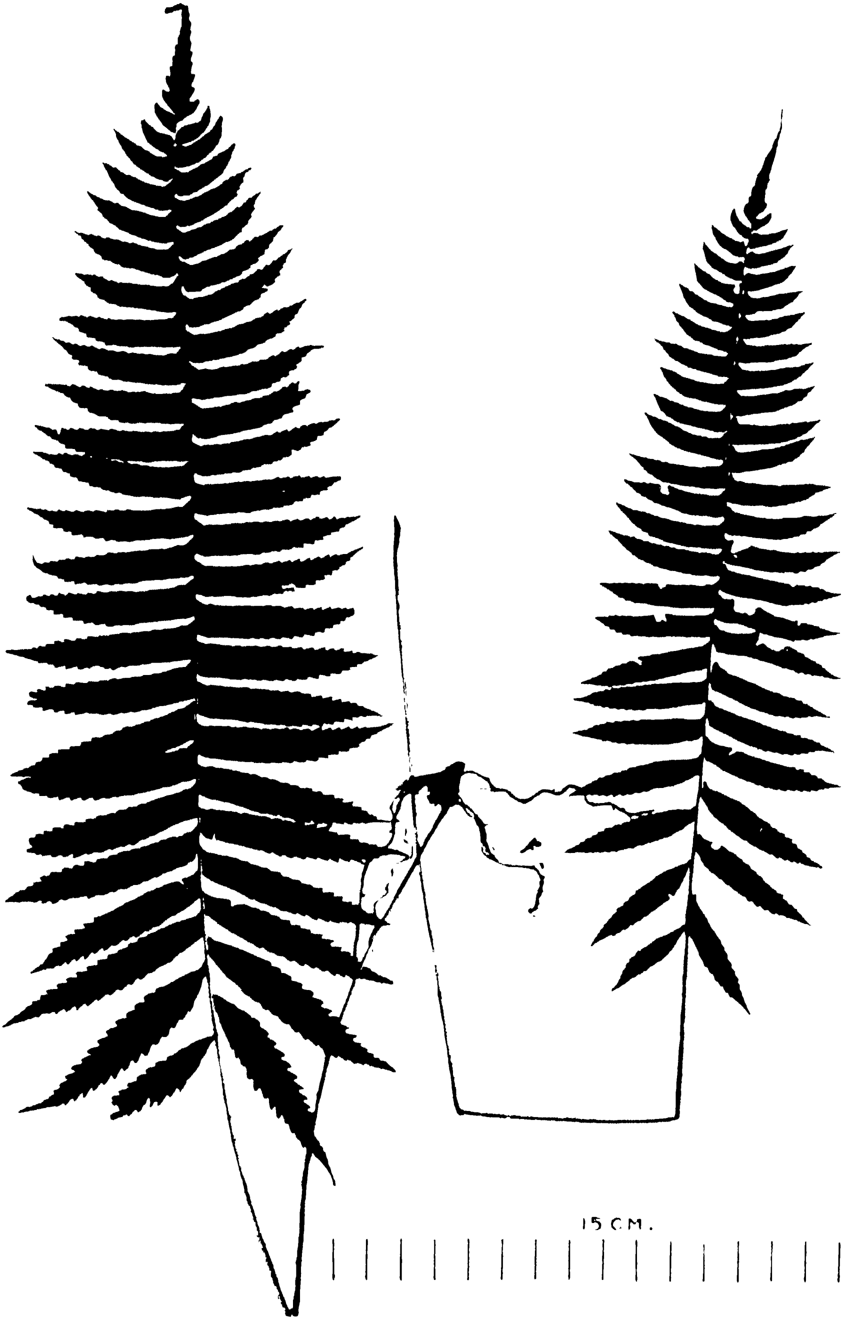

PLATE XVIII. DRYOPTERIS COMPACTA.

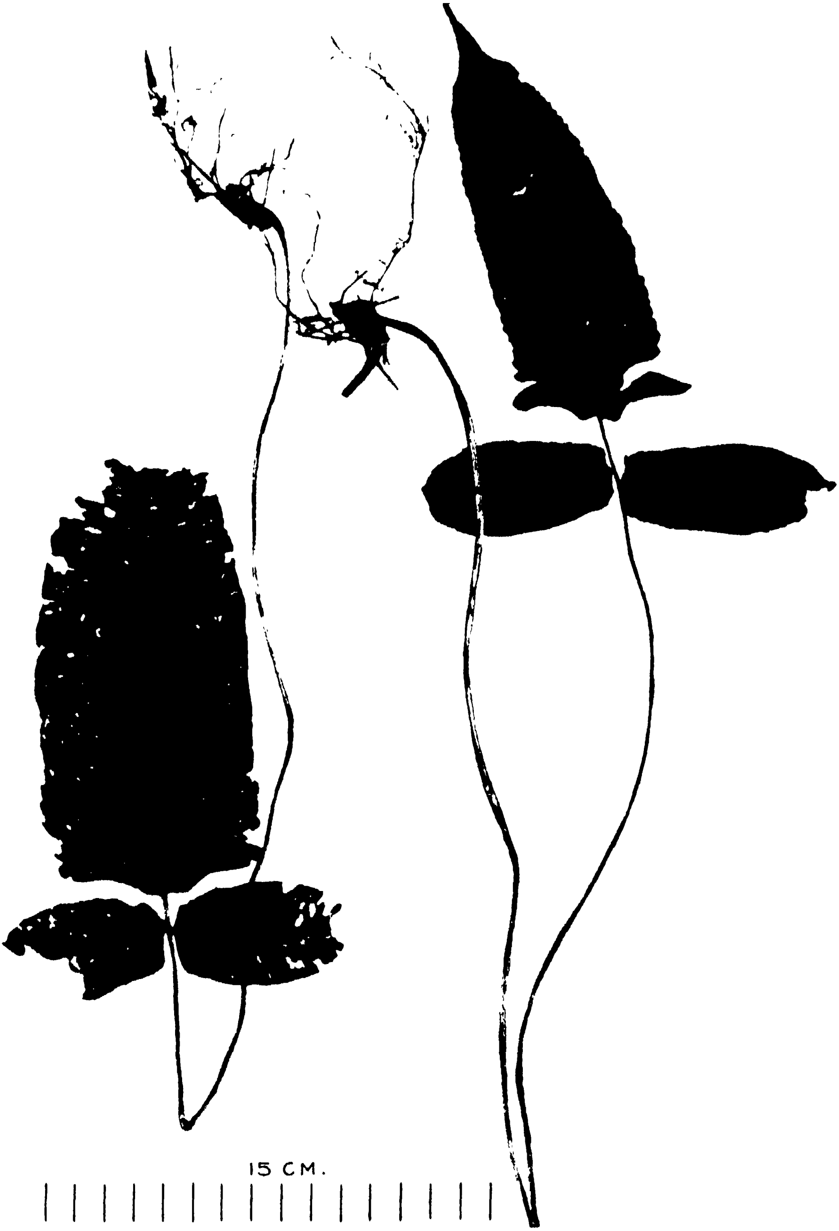

PLATE XIX. DRYOPTERIS MIRABILIS.

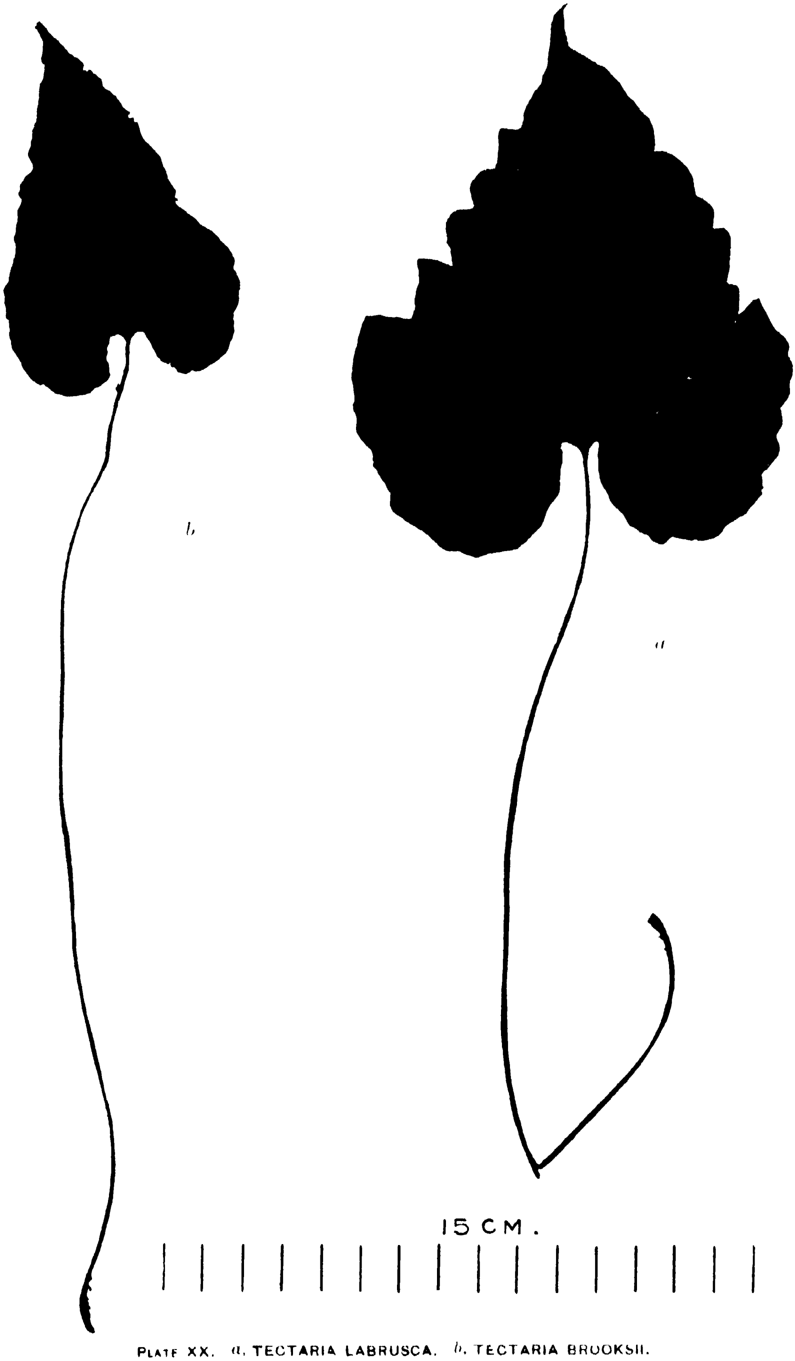

PLATE XX. *a*, TECTARIA LABRUSCA. *b*, TECTARIA BROOKSII.

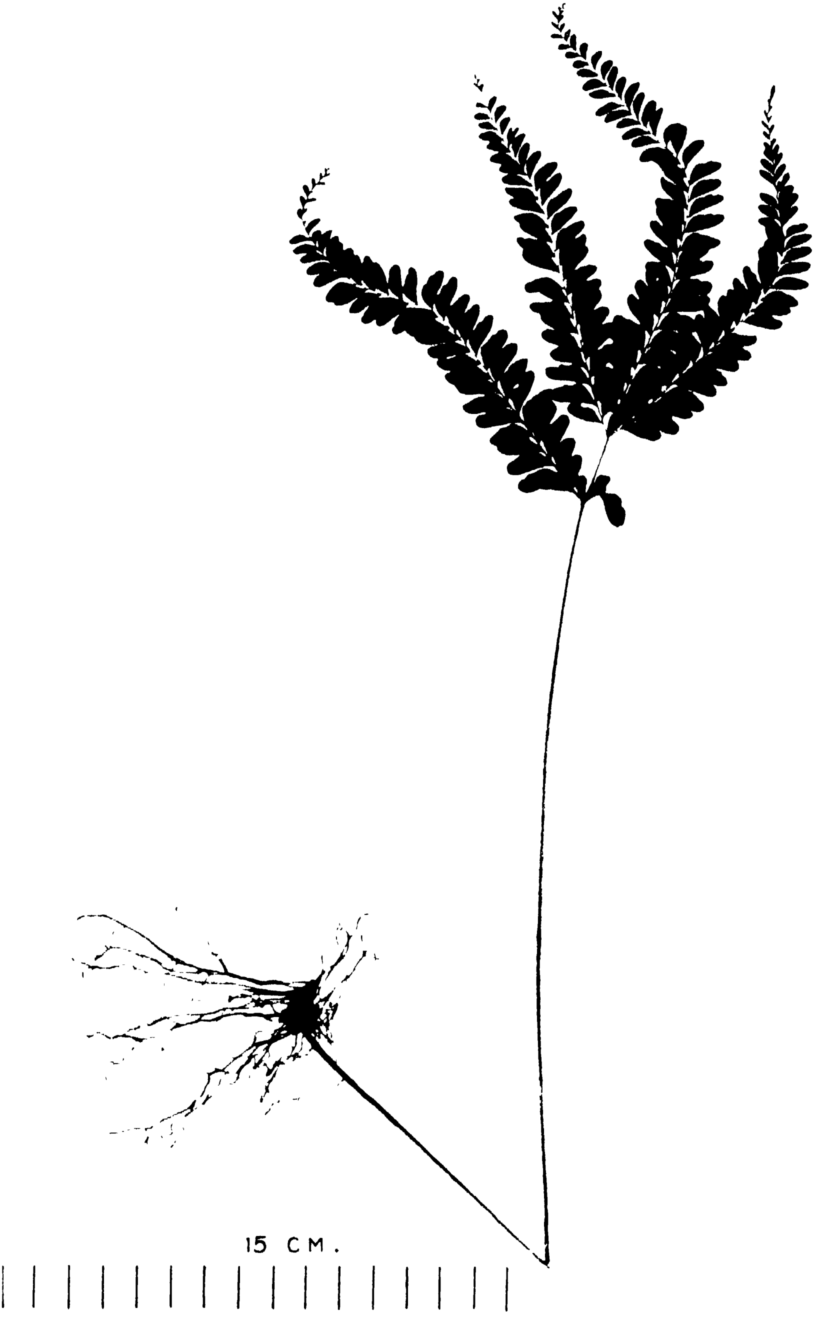

PLATE XXI. LINDSAYA NITIDA.

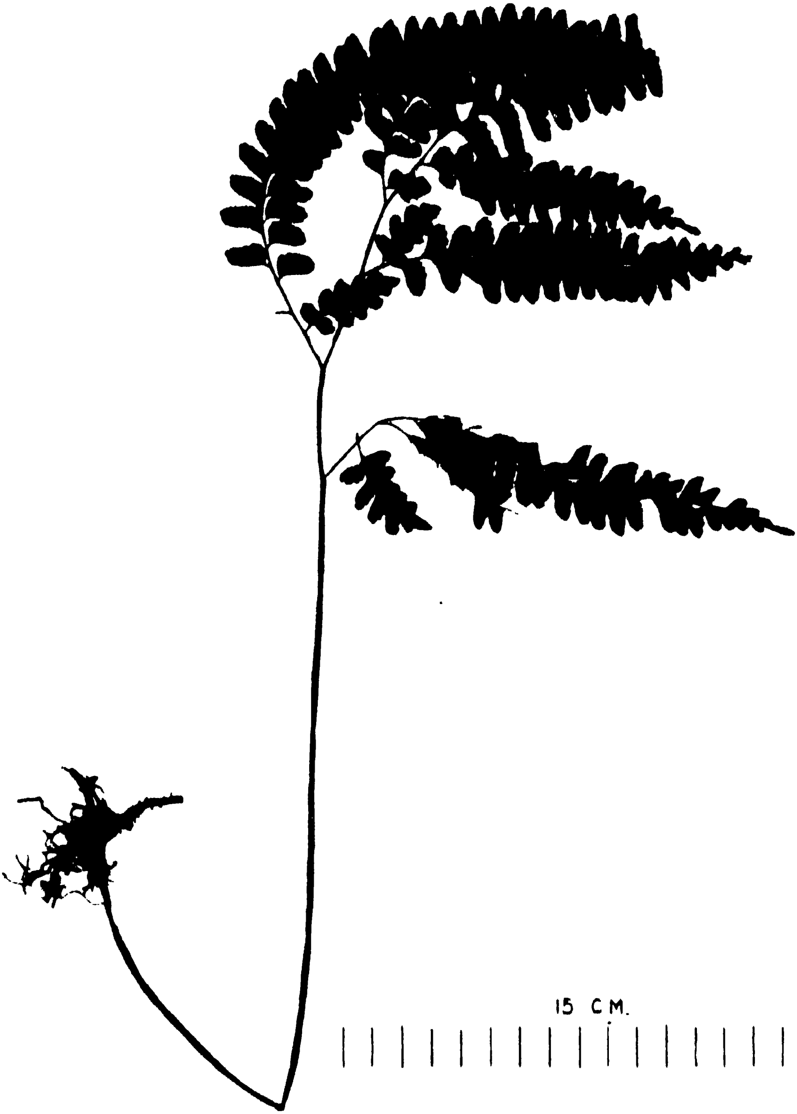

PLATE XXII. ADIANTUM PULCHERRIMUM.

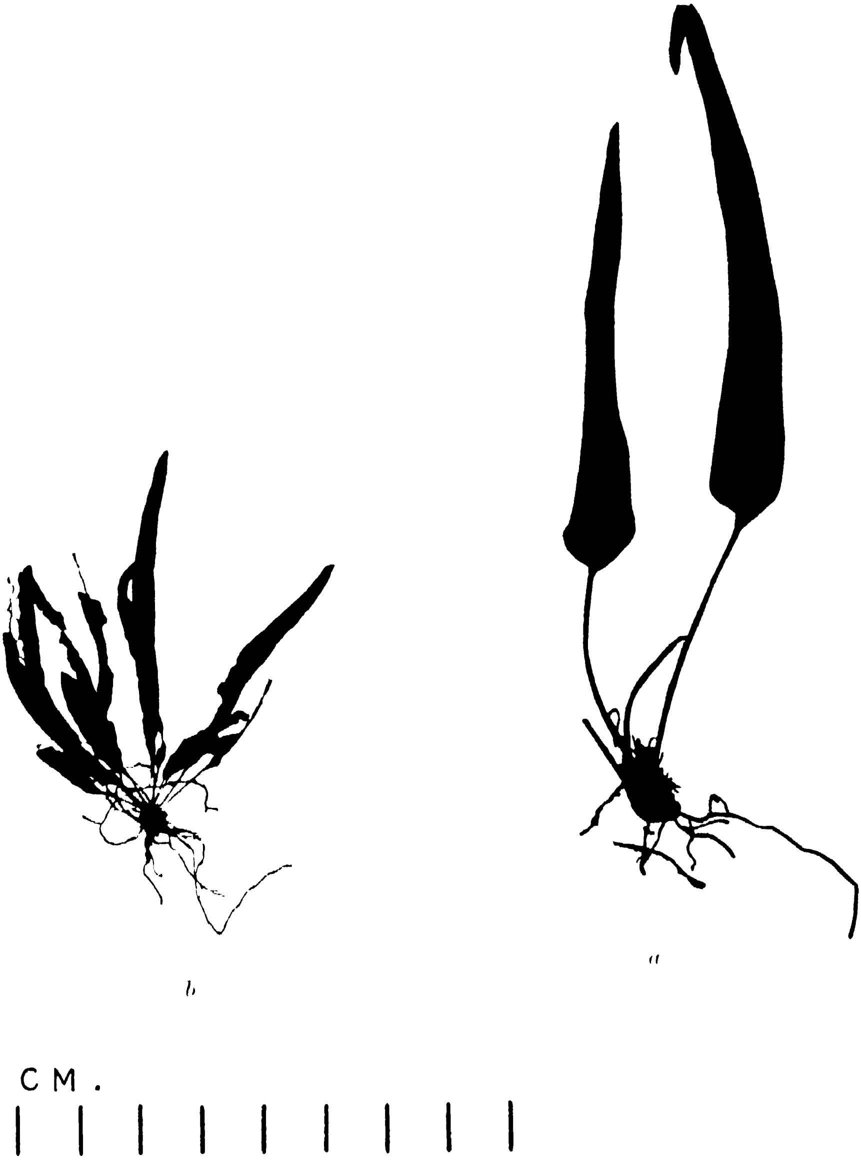

PLATE XXIII. *a*, TAENITIS BROOKSII. *b*, POLYPODIUM SPARSIPILUM.

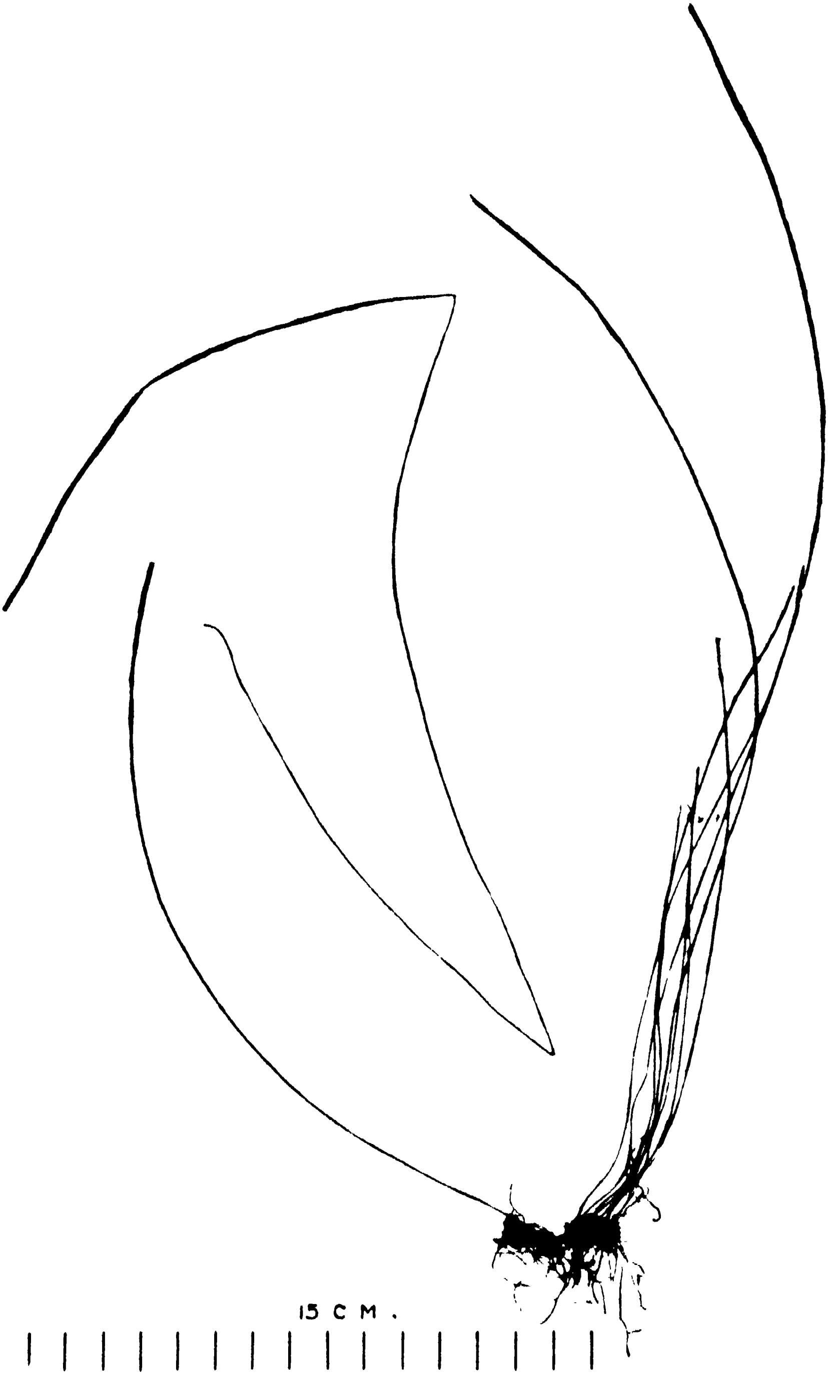

PLATE XXIV. POLYPODIUM SETACEUM.

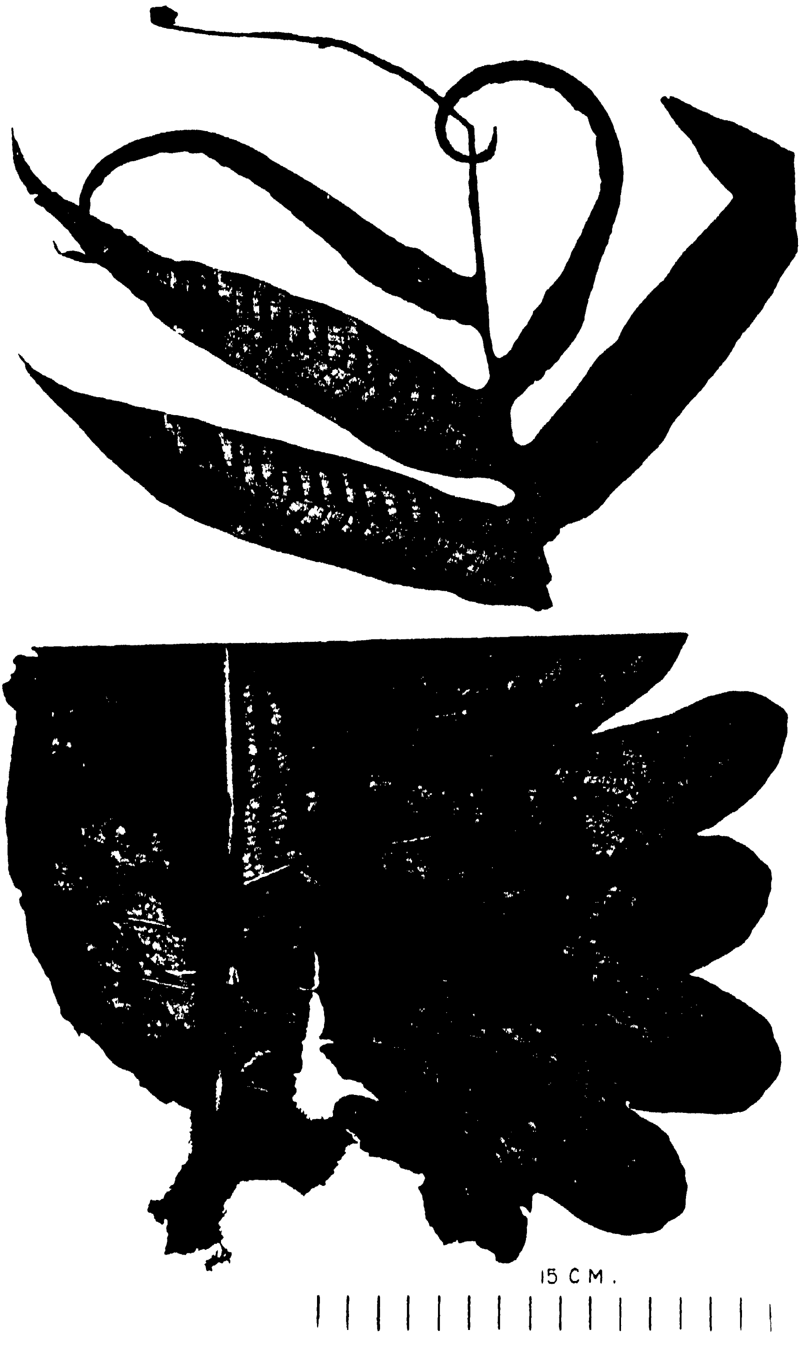

PLATE XXV. AGLAOMORPHA BROOKSII.

THE PHILIPPINE JOURNAL OF SCIENCE, C. BOTANY.
Vol. VI, No. 3, July, 1911.

NEW OR INTERESTING PHILIPPINE FERNS, V.

By EDWIN BINGHAM COPELAND.
(*From the College of Agriculture, Los Baños, P. I.*)

CYATHEA Smith.

Cyathea Robinsonii Copel. spec. nova.

Species foliis tripinnatis C. integrae J. Sm. affinis; trunco 2–4 m alto, 4 cm crasso; stipite ca. 40 cm longo, basi paleis brunneis linearibus integris fere 2 cm longis vestito, sursum atropurpureo minute squamuloso, hispido; fronde ca. 1 m alta, 70 cm lata, abrupte acuta, rhachibus praesertim minoribus paleis linearibus fulvis densissime et aliis minutis vestitis, pinnis apicalibus simplice pinnatis exceptis utroque latere ca. 9, infimis paullo reductis haud remotis, maximis medialibus, fere 40 cm longis, 16 cm latis, stipitula 2–3 cm longa; pinnulis stipitulatis horizontalibus, 16 mm latis; pinnulis^{II} usque mediam pinnulam^{I} liberis, infimis etiam brevissime pedicellatis, anguste ellipticis, obtusis, integris, supra glabris infra ad venulas setosis, supra purpureo-nigris, infra caeruleis, rigide papyraceis; venulis utroque latere ca. 6, furcatis; soris medialibus, indusio globoso, fisso.

LUZON, Province of Tayabas, Mount Binuang, *Bur. Sci. 9394 Robinson*, alt. 875 m.

As already stated this is a relative of *C. integra*, but differs in various details.

HYMENOPHYLLUM Smith.

Hymenophyllum subflabellatum Ces.

LUZON, Province of Laguna, Mount Maquiling, altitude 1,050 m, leg. *Copeland*. The published description of this minute fern is inadequate, but contains nothing to prevent this determination. It was originally described from Borneo.

DRYOPTERIS Adans.

Dryopteris sessilipinna Copel. spec. nova.

Rhizomate repente, 2–3 mm crasso, ligneo; stipitibus confertis, 5–15 cm altis, minute pubescentibus, pinnis remotis in rudimenta vix 2 mm longa abrupte contractis adspersis; fronde 12–20 cm alta, 4–5 cm lata, sursum sensim longe attenuata, pinnata, supra mediam solummodo pinnatifida, rhachi pube falcato-inflexa minuta dense vestita; pinnis sessilibus, infimis deflexis exceptis basi truncatis, apice rotundatis, 8 mm latis, approximatis, ⅓ ad ½ ad costam incisis, lobis truncatis, interdum serrulatis, minute ciliatis, subcoriaceis, costis et venis infra setosis, lamina nuda; venis utroque latere ca. 4, infimis anastomosantibus; soris medialibus, indusio rudimentario.

NEGROS, Mt. Canlaon, alt. 1,200 m, *Merrill 6934* (type). MINDANAO, Camp Keithley, *Mrs. Clemens s. n.*

In appearance very like *D. exigua* (J. Sm.) O. K. which however is a *Thelypteris* and without reduced pinnae on the stipe.

Lastraea exigua J. Sm. seems to me to be a valid species, although it has been reduced to *D. philippina* (Pr.) C. Chr. In the description of the latter, Presl states clearly that it includes but part of the plants in Cuming's No. 251; and the fern he describes is smaller in all parts than our specimen of that number. We have no plant in the group with such an indusium as Presl describes.

Lastraea exigua J. Sm. is a *nomen nudum*, and *Cuming 251* and *272* are cited as specimens. The first diagnosis accompanying the use of this specific name is given by Mettenius, Aspidium No. 180, 1858. He distinguishes two forms, α and β, the first of which is said to be *Phegopteris nervosa* Fée. This fern can be identified with absolute certainty; it is neither of the plants mentioned by Smith, both of which fall in the form β of Mettenius. It is represented in our herbaria by specimens collected in Surigao, by Bolster. Fée's name is unfortunately not valid in *Dryopteris*. In publishing the combination *Dryopteris exigua*, O. Kuntze refers to Hooker's *Nephrodium exiguum*; and Hooker's diagnosis is translated from Fée's of *P. nervosa*. Under the circumstances this fern is to be called *D. exigua* (Mett.) O. K.

Lastraea exigua J. Sm. is thus without a name, and for the plant which I have best ground to construe as this, since it is our *Cuming 251* and is not *D. philippina* (Presl) C. Chr., I propose the name **Dryopteris confusa.**

Thelypteris rhizomate repente, stipitibus confertis ca. 20 cm altis, minute puberulis; fronde 20–30 cm alta, 4–5 cm lata; pinnis sessilibus, basi truncatis haud cordatis, apice obtusis vel rotundatis, utrinque ⅓ ad ½ ad costam incisis, subauriculatis; costis et venis infra sparsissime puberulis; soris costalibus, indusio minuto, fugace.

LUZON, *Cuming 251*; Nueva Vizcaya, *Bur. Sci. 8271 Ramos.*

Dryopteris philippina (Presl) C. Chr. is very probably the plant of Cuming which we have under his number 272. Except as to the indusium it fits Presl's description satisfactorily. The indusium is small and transient, and can be detected on a small part of the sori, which in our specimen are in excellent condition. Some scales or fragments of abortive sporangia sometimes can be

seen subtending the sorus, and these may be more evident in Presl's specimen. The pinnae are decidedly auricled, and much more cut on the upper than on the lower side, in both of which respects, as well as in the hairiness of the veins, the stature, and the medial sori, it agrees with the description, but differs from our specimen of No. 251.

Still another species very similar in external appearance is *D. aoristisora* (Harr.) C. Chr. In spite of the fact that the lower veins anastomose, I regard it as nearly related to the preceding.

Dryopteris melanophlebia Copel. spec. nova.

Species gregis D. canescentis (Bl.) C. Chr. rhizomate repente, stipitibus approximatis, frondium sterilium 2–3 cm, fertilium 4–10 cm altis, primo setosis, glabrescentibus; fronde parte terminale 4–5 cm longa, 1–2 cm lata, obtusa, integra vel deorsum una-duabus lobata et infra eam utroque latere pinnis 1–3 rotundatis 2–4 mm longis sessilibus vel adnatis composita, coriaceo-papyracea, praeter costam deorsum pilosam mox glabra; venis conspicuis, infra plerisque nigris, venulis plerumque 2 connexis; soris nudis, ad venulas plus minus elongatis, costularibus.

NEGROS, Mt. Canlaon, alt. 900 m, *Merrill 6959.*

In appearance, near *D. simplicifolia,* which has hairy indusia and sori remote from the main veins. *D. canescens* var. *subsimplicifolia* Christ has the lower pinnae not very reduced.

DAVALLODES Copel.

Davallodes Kingii (Baker) Copel. comb. nov.

Davallia Kingii Baker in Hook. Icon. (1886) *pl. 1622.*

Java.

MONOGRAMMA Schkuhr.

Monogramma capillaris Copel. spec. nova.

Eumonogramma, rhizomate repente, 0.5 mm crasso, paleis atrocastaneis angustis 1 mm longis densissime obtecto; frondibus dense approximatis, stipite castaneo filiforme 15 mm longo incluso ca. 4 cm altis, 0.5–1.0 mm latis, prope apicem haud dilatatis; soris unilateralibus continuis versus marginem apertis.

NEGROS, Mt. Canlaon, *Merrill 6961.*

In appearance more like *M. dareicarpa* than *M. trichoidea,* which is much finer; differing from the former in the approximate fronds, which are longer and not widened near the apex. The sori may be more than 2 cm long. As a rare exception, a sorus appears on the other side of the costa or is indicated by a groove.

CURRANIA Copel.

Currania oyamensis (Baker) Copel. comb. nov.

Polypodium oyamense Baker in Journ. Bot. 15 (1877) 366.

Polypodium Krameri Franch & Savat. Enum. Pl. Jap. 2 (1876) 244; Hooker's Icones *pl. 1668.*

Dryopteris oyamensis C. Chr. Enum. Fil. 282.

China and Japan.

POLYPODIUM Linn.

Polypodium pulogense Copel. spec. nova.

Epiphyticum, caudice breve, basibus stipitum et paleis paucis pallide brunneis integris immerso; stipitibus brevissimis, confertis, haud articulatis; fronde 5–8 cm alta, 5–7 mm lata, utrinque angustata, pilis sparsis usque ad 1.5 mm longis fragilibus dein deciduis vestita, subcoriacea, vix ad costam pinnatifida, segmentis ipsorum latitudine separatis, ala angusta connexis, anguste triangularibus, acutis; venula in segmento sterile quoque una, in segmento fertile apud basin furcata, et ramo breve superiore solummodo monosoro; soro superficiale, orbiculare.

LUZON, Benguet subprovince, Mount Pulog, alt. 2,750 m, epiphytic in the upper edge of the mossy forest, *Copeland, P. P. E. 130, Merrill 6383.*

Polypodium pteropus Blume.

LUZON, Province of Laguna, San Antonio, *For. Bur. 17656 Curran.*

This species occurs from India and China to Papua, but I have not before seen it from the Philippines. The plants were entirely submerged, and believed by Mr. Curran to have been so at all times. The fronds are small, and rarely divided but fruiting freely. Except that the major areolae are strongly bullate, it does not differ from Chinese subaquatic specimens.

THE PHILIPPINE JOURNAL OF SCIENCE, C. BOTANY.
Vol. VI, No. 3, July, 1911.

PHILIPPINE GYMNOSPERMS.

By FRED W. FOXWORTHY.

(From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.)

This group is of relatively small economic importance in the eastern tropics; but it affords some interesting problems of distribution.

Of the 26 species of Gymnosperms now known from the Philippines, 17 are extra-Philippine in distribution, as shown in the accompanying table.

Distribution of Philippine Gymnosperms.

Species.	Africa.	Ceylon.	British India.	Burma.	Siam and Cochin China.	Malay Peninsula.	Sumatra.	Java.	Borneo.	Celebes.	Moluccas.	New Guinea.	Australia.	Formosa.	China.	Japan.	South Pacific Islands.	
Cycas circinalis	×	×	×	×			×	×		×	×	×			×	×	×	
C. sp. (Culion)																		
C. sp. (Palawan)																		
Dacrydium falciforme									×									
D. elatum				×	×	×	×		×								×	Tonkin.
D. sp.																		
Phyllocladus protractus											×	×						
Podocarpus imbricatus				×		×	×	×	×	×	×	×						Hainan.
P. blumei								×		×	×	×						
P. amarus							×	×					×					
P. glaucus																		
P. brevifolius									×									
P. pilgeri										×								
P. costalis																		
P. polystachyus						×	×	×	×									
P. neriifolius			×	×		×	×	×	×	×	×	×			×			
P. rumphii										×	×	×						
P. philippinensis																		
Taxus wallichiana			×	×			×			×								
Agathis alba					×	×	×	×	×	×	×							
Pinus insularis																		Timor.
P. merkusii				×	×		×	×	×									
Gnetum gnemon	×	×	×	×		×	×	×	×	×	×	×					×	
G. arboreum																		
G. latifolium			×	×	×		×	×	×	×	×	×						
G. minus																		
Total	2	2	5	8	4	6	11	10	10	10	9	8	1	0	2	1	3	

It is significant that Celebes, Borneo, Sumatra, Java, and the Moluccas are the regions which have the largest number of species in common with the Islands, and there is not a single species common to the Philippines and Formosa. This certainly indicates that our Gymnosperms have reached the Islands from the south and not from the north.

ECONOMIC IMPORTANCE.

Cycadaceae. *Cycas circinalis* is used locally as a food plant, both the fruit and young leaves being used. *Cycas revoluta* is introduced and commonly cultivated as an ornamental.

Taxaceae. The wood of some species may be used locally; but the species are mostly mountain forms, of infrequent occurrence and but little known.

Pinaceae. *Agathis alba* is of wide distribution in the mountains, and the resin is the Manila copal of commerce. It is extensively collected and exported. It is used locally for torches and medicinally, and is said to be one of the best preventives of leech bites. The pines furnish a supply of turpentine which is used locally. The wood of *Pinus insularis* is used in the northern part of the Island of Luzon; but the supply is not great enough to make it important as a commercial timber.

Gnetaceae. *Gnetum gnemon* has very strong bast fibers in its cortex and is used locally for cordage. The young leaves are tender and are cooked and eaten. *G. latifolium* also has very strong bast fibers and is similarly used. In some sections, the Negritos use the bark to make the strings for their bows. The fruit is edible and is generally eaten when cooked.

TAXONOMY.

The Gymnosperms are characterized by woody stems; vascular bundles of the axis arranged in a ring, a regular increase in thickness being in most cases effected by a closed cambium layer which produces phloem on the outer and xylem on the inner surface; embryo straight and embedded in endosperm; radicle developing a vigorous tap-root; flowers unisexual and (except *Gnetaceæ*) without perianth; microsporangia or pollen-sacs always borne on the under side of the microsporangium; ovulate scales not completely inclosed.

CLASS I. CYCADALES.

CYCADACEAE.

Stem tall or short with internodes suppressed, usually unbranched, bearing a crown of large compound leaves. Dioecious. Pollen-sacs and ovules foliar, sporophylls not interspersed with sterile leaves, generally aggregated in terminal cones. Vascular bundles of stem collateral and endarch, or concentric; of leaves mesarch. Embryo generally dicotyledonous, attached to a well-developed suspensor, and embedded in a copious endosperm.

CYCAS L.

Carpophore with 8–4, rarely two seeds. Stem growing up through the female flower-cluster. Leaflets with only a midrib. About 16 species in tropical Asia, Australia, and Polynesia.

KEY TO PHILIPPINE SPECIES.

a. Leaflets less than 1 cm wide, almost as thick as wide.
  b. Lower leaflets thorny .... *C. revoluta*
  bb. Lower leaflets not thorny.................................. 1. *C.* sp. aff. *cairnsiana*
aa. Leaflets 1 cm or more wide, not thick like the two preceding.
  b. Staminate cone 20–25 cm long and 5–7 cm in diam. .... 3. *C.* sp. from Palawan.
  bb. Staminate cones much thicker in proportion to length than the preceding.
2. *C. circinalis*

Cycas revoluta Thunb. Fl. Jap. (1784) 229; DC. Prodr. **16**^{2} (1868) 526; Vidal, Cat. Pl. Prov. Manila (1880) 46; F. Vill. Noviss. App. (1880) 212; Forbes & Hemsley in Journ. Linn. Soc. Bot. **26** (1902) 559.

China, Japan, and Formosa.

This plant is common in cultivation in the Philippines; but is not found outside of cultivation.

LUZON, Manila, *Merrill s. n.*

1. **Cycas** sp. aff. *C. cairnsiana* F. Müller, Fragm. **10:** 63.

CULION, *Merrill 657*, a single sterile leaf in our herbarium.

This was compared by Mr. Merrill with a fragment of the type of *C. cairnsiana* in the herbarium at Kew, and he says that it was the only specimen there with leaflets like and as narrow as the Australian plant.

2. **Cycas circinalis** L. Sp. Pl. (1753) 1188; Miq. Monographia Cycadearum (1842) 27; Prodr. System. Cycad. (1861) 7, 17; Blanco Fl. Filip. (1837) 745; ed. 2 (1845) 513; Blume, Rumphia **4** (1848) 11, 15, *t. 176B, 176C*; DC. Prodr. **16**^{2} (1868) 526; Vidal Cat. Pl. Prov. Manila (1880) 46; Sinopsis Atlas (1883) 43, *t. 99*; F.-Vill. Noviss. App. (1880) 212; Dyer in Hook. f. Fl. Brit. Ind. **5** (1888) 656; Warburg, Monsunia **1** (1900) 178; Usteri Beitr. Kenn. Phil. Veg. (1905) 134; Wight in Contrib. U. S. Nat. Herb. **9** (1905) 71, 252, *pls. 8, 14*; Merr. Bur. Govt. Lab. Publ. (Philip.) **27** (1905) 82; Phil. Journ. Sci. **1** (1906) Suppl. 24; Phil. Journ. Sci. **3** (1908) Bot. 394; Koorders-Schumacher Syst. Verz. Herb. Koord. **3** (1911) Cycadaceae [1.] Plate XXVI, figs. 1, 2.

Stems tall, said sometimes to attain a height of 12 m, usually unbranched, but sometimes divided at the apex of the stem into three, four, or five branches. Sometimes as much as 50 cm in diameter. Leaves 1.5–2.5 m long; petiole 50–60 cm, with short distant slightly deflexed spines to near the base; leaflets about 90–100. Adult leaflets about 20–30 cm long, about 1 cm wide, elongate-linear-lanceolate, subfalcate, acuminate. Male cone shortly peduncled, often 50 cm long, cylindric-ovoid; antheriferous scales 2–5 cm long, 1–2 cm wide, obovate-deltoid, prolonged into an upward curved subulate acumen about 2.5 cm long, clothed with a brown tomentum externally, glabrous above. Carpophylls about 30 cm long, long-stalked, with 3–5 pairs of ovules above the middle, ferruginous-tomentose; blade 7–10 cm long, 2.5–3.5 cm wide. Seeds 3–5 cm long.

BATANES ISLANDS, Camiguin, *Worcester A, Bur. Sci. 3977 Fenix;* Batan, *For. Bur. 15289 Agudo.* LUZON, Province of Cagayan, *For. Bur. 17251 Curran:* Province of Zambales, *For. Bur. 6327, 6328 Curran:* Province of Bataan, *Merrill 3257, Whitford 269, 1325, For. Bur. 2577 Meyer, For. Bur. 7381, 7513 Curran, Cuzner 22, Whitford & Foxworthy s. n., For. Bur. 12397 Curran & Merritt:* Province of Rizal, *Bur. Sci. 3281 Ramos:* Province of La Laguna, *For. Bur. 10156 Curran:* Province of Tayabas, *For. Bur. 10319, 10344 Curran:* Province of Cavite, *For. Bur. 7671 Curran:* Province of Batangas, *For. Bur. 7737 Curran & Merritt.* POLILLO, *Bur. Sci. 10776 McGregor.* MINDORO, *For. Bur. 8613 Merritt.* MINDANAO, Province of Surigao, *Bolster 280:* District of Davao, *Copeland s. n., Williams 3058:* District of Zamboanga, *Copeland s. n., For. Bur. 9398 Whitford & Hutchinson.* BASILAN, *For. Bur. 3441 Hutchinson.* TAWI TAWI, *Bur. Sci. 10823 Foxworthy.*

Some of our specimens have been found along the seashore and some on dry ridges at some distance from the coast. It is possible that some of our material should be referred to *C. rumphii* Miq.; but I have been unable to find any sure means of distinguishing between the two. The species is very imperfectly understood and will repay further study.

The seeds are poisonous when fresh; but, when thoroughly washed and cooked, they furnish a sort of sago. This sago is used in the Batanes Islands north of Luzon. The young leaves are said to be cooked and eaten for food in the Province of Bataan, Luzon.

Native names: *uliva, patubo.*

Distribution: Africa, Ceylon, British India, Burma, Sumatra, Java, Celebes, the Moluccas, New Guinea, China, Japan, and the islands of the South Pacific.

3. **Cycas** sp. Plate XXVII.

For. Bur. 3842 Curran, collected in Palawan in March, 1906, is a very curious form with leaves like *C. circinalis* and a very peculiar, slender staminate cone.

Probably a new species; but I do not feel warranted in describing it at the present time.

CYCAS ? HYPOLEUCA Presl in Epim. Bot. (1851) 238; F. Vill. Noviss. App. (1880) 212.

This form is not properly referred to this genus. It is considered to be a palm.

Class V. CONIFERAE.

Stem branched. Vessels in secondary wood wanting. Leaves usually small, linear or lanceolate. Flowers monoecious, always borne on the upper side of a scale. Cotyledons 2–15, always free. Vascular bundles of stem and leaf collateral and endarch. Embryo attached to a suspensor and embedded in endosperm.

Fam. 1. TAXACEAE.[1] Ovules solitary or few, terminal, axillary or attached singly to the upper surface of a simple sporophyll. Seed often with a fleshy aril. Mesophyll of the leaves with resin-canals, except in *Taxus.* About 70 species in tropical and subtropical regions.

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[1] In this family, the descriptions of genera and species have been taken largely from Pilger's monograph in Engler, Das Pflanzenreich 4.^{5}

FAM. II. PINACEAE. Ovules associated in perfect cones; the seeds hidden between the scales till ripe; the testa woody or leathery, never fleshy; aril never formed. Mesophyll of the leaves always with resin-canals. About 300 species, mostly in temperate regions.

KEY TO PHILIPPINE GENERA OF TAXACEAE.

a. True leaves reduced, phylloclades developed.................... 3. *Phyllocladus*
aa. Leaves truly foliaceous.
  b. Anther-cells 2; carpels 1-ovuled; epimatium always developed.
    c. Epimatium free from the integument.................... 1. *Dacrydium*
    cc. Epimatium always grown together with base of carpel....... 2. *Podocarpus*
  bb. Anther cells 3–8; carpels bi-ovulate or reduced to a single terminal ovule on the squamate stem; epimatium wanting. Seed surrounded by an aril. 4. *Taxus*

1. DACRYDIUM Soland.

Flowers dioecious, rarely monoecious. Staminate flowers terminal; microsporophylls leaves, scarcely or not at all changed; apiculae large; male flowers rarely densely imbricate, anthers borne at the base of squamate axillary scales in the manner of *Podocarpus;* cells always 2. Pistillate flowers terminal or rarely on short axillary branches; carpidia 1-several, free; ovule single, epimatium and covering turned and affixed to the base; epimatium almost wholly covering the young ovule; young ovules more or less inverted, micropyle facing toward the base of the carpidium, falsely erect; seeds surrounded by the base of the epimatium; testa hard; integument of the ovule always free from the epimatium, not connate with it. Trees or shrubs. Leaves rarely ovate-lanceolate and mostly small, squamiform or of different forms, in young state like linear leaves, in adult state transformed into squamiform leaves.

Sixteen species in the Malayan region, New Zealand, and Tasmania.

KEY TO THE PHILIPPINE SPECIES.

a. Leaves elongate, ovate-lanceolate, base falcate.................. 1. *D. falciforme*
aa. Adult leaves squamiform or subulate.
  b. Adult leaves usually triangular in section.................. 2. *D. elatum*
  bb. Adult leaves tetrangular in section.................. 3. *D. sp.*

1. **Dacrydium falciforme** (Parl.) Pilger in Engler Das Pflanzenreich 4^{5} (1903) 45; Foxworthy ex Merrill in Philip. Journ. Sci. 2 (1907) Bot. 257. Plate XXVIII, fig. 1.

Podocarpus falciformis Parl. in DC. Prodr. 16^{2} (1868) 685; Rendle in Journ. Bot. 34 (1896) 355; Warburg, Monsunia 1 (1900) 193.

Nageia falciformis O. Ktze. Revis. Gen. Pl. 2 (1891) 800.

Very distinct by virtue of its ovate-lanceolate falciform leaves. The Bornean form, as I have seen it, has usually slightly larger leaves than the Philippine.

Tree or shrub, branches spreading; leaves subdistichous, coriaceous, rather broad, falcate, acuminate mucronate, base acuminate, 2–4 cm long, 6–8 mm broad, midrib obtuse evident. Staminate flowers were not found with the type material. Mr. Merrill collected material on Mount Halcon which shows one staminate cluster which is about 6 cm long and 3 mm in diameter, terminal on a short branch. Pistillate flowers on short branches 5–6 mm long; pistillate branches with numerous squamate, tenuous, spreading, imbricate, triangular, carinate scales, which are crowded together toward the upper end of the branch; ovule single, terminal.

First collected in the Philippines by Whitehead in 1895, on one of the shoulders of Mount Halcon, Mindoro, next collected by Mr. Merritt, *For. Bur. 4425*, June 1906 in fruit, and finally by Mr. Merrill *5744* in Nov. 1906. Mr. Merrill says that it was a tree about 12 m tall, growing at an altitude of 1,800 m.

The species is now known from the mountains of Poe, Santubong and Matang in Sarawak, where it occurs at altitudes of from 600 to 1,500 m and on Mount Halcon, Mindoro. It is also known from Lingga (*Teysmann 69*).

The tree has much the habit of a *Podocarpus*. The leaves on young plants are sometimes as much as 6 cm long and are proportionately more slender, more lanceolate in shape than they are in adult material.

2. **Dacrydium elatum** (Roxb.) Wall. ex Hook. in Journ. Bot. **2** (1843) 144, *t. 2;* Blume, Rumphia **3** (1847) 221, *t. 172 B, f. 1, t. 172 C, f. 2;* De Boer, Conif. Archip. Ind. (1866) 29 (descriptio valde extensa); Parl. in DC. Prodr. **16^{2}** (1868) 494; Hook. f. Fl. Brit. Ind. **5** (1896) 648; Rendle in Journ. Bot. **34** (1896) 355; Foxworthy ex Merrill in Philip. Journ. Sci. **2** (1907) Bot. 257; Pilger in Engler Das Pflanzenreich **4^{5}** (1903) 51.

Juniperus elata Roxb. Fl. Ind. **3** (1832) 838.

Juniperus rigida Sieb. & Zucc. Fl. Jap. **2** (1842) 109, *t. 125*.

Juniperus philippsiana Wall. ex Gord. Pin. (1858) 75.

Dacrydium junghuhnii Miq. Pl. Junghuhn. **1** (1851) 4; Fl. Ind. Bat. **2** (1859) 1075.

Tree 10–15 m tall; branches verticillate, the lower very long deflexed, the upper erect spreading, much branched. Juvenile leaves aciculate, subulate, more or less falcate and spreading, acute, subpungent, triangular in section, 10–18 mm long; adult leaves densely clothing the branchlets, gradually smaller, more rigid, less curved, stiff, squarrose-spreading, subulate or narrowly linear, inserted on a spreading and slightly decurrent base, shortly acute or rarely obtuse, often obscurely tetragonal in section, carinate without, the sides sulcate more or less impressed-notate, 5–7 to 9 mm long, these diverse forms connected by intermediate forms; finally the leaves in the region of fruit, on stiff branches, erect, squamiform, densely imbricate, adpressed, rigid, triangular-ovate, apex slightly incurved, rather obtuse, carinate on dorsal face, 1–1.5 mm long. Male inflorescence terminal, narrowly cylindrical, dense, 5–7 mm long; anthers usually apiculate, from a broadly triangular base acute; cells 2, ovate-globose, dehiscing at the sides without. Female flowers at the apex of branchlets; ovule inverted. Seed finally erect, terminal or a little infraterminal, ovoid, obtuse, subtrigonous, micropyle apiculate.

Mindoro, Mount Halcon, *For. Bur. 4419 Merritt, Merrill 5789*; Mount Palong, *For. Bur. 8527 Merritt.* Panay, Province of Antique, Mount Midiaas, *Yoder s. n.* Negros, Mount Silay, *For. Bur. 4227 Everett, For. Bur. 4543 P. del Villar, For. Bur. 13612, 13621 Curran & Foxworthy.* Mindanao, Province of Misamis, Mount Malindang. *For. Bur. 4547, 4548, 4731 Mearns & Hutchinson:* District of Zamboanga, *Copeland s. n.*, probably this species although not a typical form.

This is distinctly a plant of high elevations. All the above were found at 1,000 or more meters elevation. Where the tree occurs, it is abundant, forming a large part of the stand. Distribution: Monsoon region; Burma; Siam and Cochin China; Tonkin, Than-Moi; Malacca, Singapore; Penang; Sumatra; Borneo; Fiji Islands; and the Philippines.

3. **Dacrydium** sp. aff. *D. beccarii* Parl. Foxworthy in Philip. Journ. Sci. **2** (1907) 258.

This form, with long, very slender, aciculate, 4-angled leaves is possibly a young form of *D. elatum*, although the very slender long leaves do not look like that species.

Mindoro, Mount Halcon, at 2,400 m, *Merrill 5714*, Nov. 1906, a single sterile specimen from a young tree in a thicket on a ridge.

2. PODOCARPUS L'Hérit.[2]

Dioecious or very rarely monoecious. Male flowers rarely terminal like those of *Dacrydium* and single or several together sessile or pedunculate in the axils of leaves, surrounded by the squamate sterile bases, sometimes aggregated or in an inflorescence at the apex of a shortened branch, rarely spicate (*Stachycarpus*); anthers often imbricate, always composed of 2 cells, apiculus usually small. Female flowers rarely spicate, ovules remote (*Stachycarpus*), or rarely ovules 1 or 2 at the apex of a short, scarcely thickened branch; flowers often single, pedunculate in the axils of leaves, receptacle fleshy and base squamate, in the fertile part composed of 1 or 2 carpidia; carpidia always uniovulate; ovules and covering much exceeding the carpidia, rarely grown together with the carpidia at the apex (*Dacrycarpus*); epimatium smooth curved, with integument of the ovule inverted, the micropyle always facing the base of the connate carpidia. Seeds often large; often ± apiculate, testa double, involute, exteriorly fleshy or fleshy-coriaceous, inner layer thickly ligneous or scarcely different from the outer. Spreading shrubs or trees. Leaves rarely squamiform (*Dacrycarpus*), often linear or elongate, lanceolate or ovate, often acute or mucronate and usually spirally inserted, spreading, distichous, rarely opposite or subopposite (*Nageia*).

Of the five sections of the genus as recognized by Pilger, four are represented in the Philippines.

The genus contains about 60 species and is found in eastern Asia and Malaya and the temperate regions of the southern hemisphere. It seems to reach its greatest development in the Malayan region. The Philippines, with eleven species, show a very rich representation of the genus. The Philippine species show the closest relationship to those of Borneo and Celebes.

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[2] One of the *nomina conservanda* of the Vienna Congress.

All our species except *P. polystachyus* are mountain, often high mountain, forms. *P. polystachyus* alone comes down to sea-level and is frequently found in rocky places at or near the beach.

Natural reproduction seems to be easy in most places where representatives of this genus are found.

In *P. polystachyus*, and possibly other species as well, the young seedlings show only 2 cotyledons.

In some cases, the fleshy receptacle of the fruit is eaten; and there is a very limited use made of the wood. Aside from these, the members of the group are not used.

KEY TO PHILIPPINE SPECIES.

a. Leaves dimorphous, very variable; larger leaves 13–17 mm long, smaller ones closely appressed, acuminate. (Sect. *Dacrycarpus.*) .... 1. *P. imbricatus*
aa. Leaves of one kind, linear, lanceolate or ovate.
  b. Leaves broad, lanceolate, opposite or subopposite. (Sect. *Nageia.*) 2. *P. blumei*
  bb. Leaves linear or lanceolate or elliptic, alternate.
    c. Receptacle not developed. (Sect. *Stachycarpus.*)
      d. Leaves green on both surfaces, more than 5 cm long; large trees. 3. *P. amarus*
      dd. Leaves glaucous beneath, less than 3 cm long; alpine shrubs. 4. *P. glaucus*
    cc. Receptacle developed, fleshy. (Sect. *Eupodocarpus.*)
      d. Leaves never long-attenuate in the upper part, lanceolate or elliptic-lanceolate.
        e. Leaves less than 5 cm long.
          f. Leaves acute or mucronulate at apex, 4–7 mm wide. 5. *P. brevifolius*
          ff. Leaves usually rounded or obtuse at apex, 10–12 mm wide. 6. *P. pilgeri*
        ee. Leaves 5 cm or more in length.
          f. Male catkins numerous, fasciculate; sea-level forms. 8. *P. polystachyus*
          ff. Male catkins not fasciculate; mountain forms.............. 7. *P. costalis*
      dd. Leaves long-attenuate in the upper part.
        e. Upper half of leaf uniformly attenuated to the acute apex. 9. *P. neriifolius*
        ee. Leaves not so uniformly attenuated in the upper half.
          f. Leaves narrow, gradually narrowed into petiole. 10. *P. philippinensis*
          ff. Leaves large, abruptly narrowed into petiole........... 11. *P. rumphii*

Section I. DACRYCARPUS Endl.

Much branched trees; leaves very small. Juvenile and adult foliage very distinct. Male flowers terminal, anthers on leaves which are but slightly modified; apiculus large. Female flowers terminal; receptacle small, verruculose; fertile carpidium single, connate with the ovule for its whole length; ovule inverted. Seed small, broadly ovoid or ovoid-globose, adnate carpidium scarcely discernible in seed.

1. **Podocarpus imbricatus** Blume Enum. Pl. Javae (1827) 89; Pilger in Engler Das Pflanzenreich 4^5 (1903) 56.

P. cupressina R. Br. ex Mirb. Geogr. Conif. in Mém. Mus. **13** (1825) 75 (nomen !); Bennett in R. Br. Pl. Jav. Rar. **1** (1838) 35, *t. 10;* Blume Rumphia **3** (1847) 218, *t. 172, f. 2* et *172B, f. 2;* Endl. Syn. (1847) 222; De Boer, Conif. Archip. Ind. (1866) 25; Carr. Conif. **2** (1867) 677; Parl. in DC. Prodr. 16^2 (1868) 521; Miq. Fl. Ind. Bat. **2** (1859) 1074; Beccari, Malesia **1** (1878) 179; F.-Vill. Noviss. App. (1880) 211; Vidal Sinopsis Atlas xliii, *t. 97, f. B.;* Phan. Cum. Philip. (1885) 160; Rev. Pl. Vasc. Filip. (1886) 295; Ceron Cat. Pl. Herb. (1892) 187; Warburg, Monsunia **1** (1900) 191; Koorders & Valeton, Bijd. Ken. Boomsoort. Java **10** (1904) 262; Koorders-Schumacher, Syst. Verz. Herb. Koord. **3** (1911) Taxaceae 3.

P. cumingii Parl. in A. DC. Prodr. 16^2 (1868) 521.

Nageia cumingii O. Ktze. Revis. Gen. Pl. **2** (1891) 800.

P. horsfieldii Wall. Cat. n. 6049, Endl. l. c.

Taxodium horsfieldii Knight Syn. Conif. 21.

Nageia cupressina O. Ktze. l. c. 800.

P. imbricatus Blume var. *cumingii* (Parl.) Pilger l. c. 56; Perk. Frag. Fl. Philip. (1904) 44; Foxworthy ex Merrill in Philip. Journ. Sci. **2** (1907) Bot. 258; Merr. in Philip. Journ. Sci. **5** (1910) Bot. 324.

I can not see any way in which the variety *cumingii* is distinct from the species. This is the commonest and most widely distributed species of the family in the Philippines. It covers the tops of many of our mountains. Found at elevations of from 900 to 2,700 m.

LUZON. Subprovince of Bontoc, *For. Bur. 14465 Darling, For. Bur. 10960 Curran:* Subprovince of Lepanto, *Merrill 4503, 4546, For. Bur. 5691, 5727 Klemme, For. Bur. 14498 Darling:* Province of Abra, *For. Bur. 14584, 14589 Darling:* Subprovince of Benguet, *Elmer 6550, 6551, Williams 1299, 1298, Bur. Sci. 4405 Mearns, For. Bur. 5036, 10825, 10829 Curran, For. Bur. 14187, 14190 Merritt, For. Bur. 18049 Curran, Merritt & Zschokke, For. Bur. 18365 Alvarez, Bur. Sci. 8828 McGregor:* Province of Zambales, *For. Bur. 8103 Curran & Merritt:* Provinces of Laguna and Tayabas, Mount Banajao, *Cuming 803, For. Bur. 213, 874 Klemme, Dec. Phil. For. Fl. 66 Klemme, For. Bur. 7886, 7905 Curran & Merritt, Whitford 951, Bur. Sci. 2387 Foxworthy, Bur. Sci. 6060, 6565 Robinson, Calvin 323, Loher 4852, 7137.* MINDORO, *For. Bur. 4446, 4471, 8528, 8529 Merritt, Merrill 5563.* PANAY, Province of Antique, *Yoder s. n.* NEGROS, Mount Canlaon, *Merrill 7032.* MINDANAO, Province of Misamis, *For. Bur. 4666 Mearns & Hutchinson:* District of Zamboanga, *Copeland s. n.*

Warburg, l. c. 192, mentions the occurrence of nodule-bearing roots in this species. The Philippine material also shows these nodules on all the specimens examined.

Distribution: Monsoon region: Java, on mountains from 1,000 m high and upward; west Sumatra; south Celebes; the Moluccas; south and west Borneo; the Malay Peninsula; northern Burma; the Philippines; and New Guinea.

Section III. NAGEIA Endl.

Leaves opposite or subopposite, often large, ovate or ovate-lanceolate, midrib wanting. Male inflorescences often several, fasciculate on axillary peduncles. Female flowers with or without distinct receptacle, often single axillary; seeds globose, rarely attenuate towards the base.

2. **Podocarpus blumei** Endl. Syn. (1847, Majo) 208; Parl. in DC. Prodr. **16**^{2} (1868) 508; Beccari, Malesia **1** (1877) 179; Pilger in Engler Das Pflanzenreich **4**^{5} (1903) 60; Koorders, Meded. 's Lands. Plant. **19** (1898) 264; Koorders & Valeton, Bijd. Ken. Boomsort. Java **10** (1904) 261; Merr. in Bur. Govt. Lab. Publ. (Philip.) **17** (1904) 5; Philip. Journ. Sci. **1** (1906) Suppl. 24; Foxworthy ex Merr. in Philip. Journ. Sci. **2** (1907) Bot. 258; Koorders–Schumacher, Syst. Verz. Herb. Koord. **3** (1911) Taxaceae 2. Plate XXVIII, fig. 2.

P. latifolia Blume Enum. Pl. Javae (1827) 89; De Boer, Conif. Archip. Ind. (1866) 12; C. B. Robinson in Bull. Torr. Bot. Club **35** (1908) 63, non Wall. Pl. As. Rar. (1830 !)

P. agathifolia Blume Rumphia **3** (1847, Junio) 217, *t. 173*.

Nageia blumei Gord. Pin. (1858) 135; Carr. Conif. (1867) 640.

P. latifolia forma *ternatensis* De Boer l. c. 14; forma luxurians.

Usually small trees, much branched, 5–15 m tall, trunk erect, crown broad spreading; branches terete, spreading, fuscous, the ultimate opposite, greenish; buds coriaceous, acuminate. Leaves subopposite, thickly coriaceous, elliptic or elliptic-lanceolate, apex sharply turned rarely long acuminate, obtuse or rarely acute, base thick abruptly or gradually narrowed into the petiole, in drying striatulate, 9–13 cm long and to 4 cm broad, rarely to 15–16 cm long and to 5 cm broad. Flowers dioecious; male 3–7 aggregated fasciculately in pedunculate axillary very short cylindraceous clusters, to 1.5 cm long; anthers with short apiculus, broadish, sharply acute. Female flowers opposite, axillary, forming short branches; peduncles 6 mm long; receptacle elongate cylindraceous, fleshy, bearing short, free, acute, persistent, squamiform leaf-blades; seed globose dark green, testa double, exterior tenuous-coriaceous; interior osseous, fragile.

Leaves usually much resembling those of *Agathis alba;* but with more acute apex. Trees much smaller than *A. alba*, usually not exceeding 10 or 15 m in height and 1 dm diam. A tree of the lower mountain ridges. Very local in distribution.

LUZON, Province of Cagayan, *For. Bur. 16738, 17200 Curran:* Province of Bataan, *Copeland 244, Williams 399, 753, 1035, For. Bur. 147, 194 Barnes, Whitford 1353, For. Bur. 1716 Curran.* MINDORO, *Merrill 5728.* This last number is from young sterile shoots and looks surprisingly like young *Agathis* material; but, I have placed it here because all the leaves taper to an acute tip.

Distribution: Monsoon region: Java, in the mountains of the western part of the island; Moluccas, Ternate; Celebes; New Guinea; Philippines.

Sect. IV. STACHYCARPUS Endl.

Male flowers arranged in terminal spikes which are single or several in the axils of bracts, or single or several in the axils of leaves, rarely several, fasciculate at the apex of a peduncle. Female flowers spicate forming woody branches or on twigs which are leafy at the base; ovules several, scattered, or ovules 1 or 2 at the apex of twigs which are leafy, or squamate at the base, woody, scarcely thickened at the apex; carpidia always small. Seeds and seed-coats large, testa double, interior thick, hard, woody. Spreading trees, often of great size. Leaves small, linear, or elongate, lanceolate, biseriate in one plane or slightly twisted.

3. **Podocarpus amarus** Blume Enum. Pl. Javae (1827) 88, et Rumphia **3** (1847) 213, *t. 170;* Endl. Syn. (1847) 217; Miq. Fl. Ind. Bat. **2**' (1859) 1073; De Boer, Conif. Archip. Ind. (1866) 20; Carr. Conif. (1867) 667; Parl. in DC. Prodr. **16**^{2} (1868) 516; Warburg, Monsunia **1** (1900) 192; Pilger in Engler Das Pflanzenreich **4**^{5} (1903) 68. Koorders & Valeton, Bijd. Ken. Boomsort. Java **10** (1904) 263; Foxworthy ex Merr. in Philip. Journ. Sci. **2** (1907) Bot. 258; Koorders-Schumacher, Syst. Verz. Herb. Koord. **3** (1911) Taxaceae 1.

P. sprengelii Blume in Flora (1824) 292 (nomen).

P. euryncha Miq. l. c. 1074; F.-Vill. Noviss. App. (1880) 211; De Boer, l. c. 24.

P. dulcamara Seem. in Bonplandia **9** (1861) 253; **10** (1862) 365.

P. pedunculata Bailey in Queensland Agric. Journ. **5*** (1899) 390, 404, *t. 149;* Queensland Fl. **5** (1902) 1498.

Leaves spirally inserted, elongate, lanceolate or linear-lanceolate, subcaudate-acuminate, midrib depressed above. Ovules in flower usually 1, rarely 2. Male flowers several, fasciculate at the apex of axillary peduncles. Leaves 6–10 cm long, and 7–9 mm broad, rarely to 16 cm long and 12–18 mm broad. Female flowers on short axillary branches 3–5 cm long, squamae rudimentary, arranged decurrently on the branch; these squamae or half scars clustered at the base of the branch, more distant above; the uppermost squamiform leaves 2 or 3 at the apex of small distant branches, very short, forming broadly obtuse carpidia; ovules elliptic, apex slightly attenuate. Seeds subglobose, gibbous, slightly extra-apical, obtuse, 2.5–3 cm long, testa double, the outer coriaceous-fleshy, 3–4 mm thick, the inner hard woody, 1.5–2 mm thick.

LUZON, Subprovince of Lepanto, *For. Bur. 10951 Curran:* Subprovince of Benguet, *For. Bur. 10895 Curran*, *For. Bur. 18029 Merritt*, *For. Bur. 18356 Alvarez.* MINDORO, *Merrill 5703.*

Distribution: Monsoon region and eastern Australia: Java; Sumatra; Philippines; Queensland.

4. **Podocarpus glaucus** Foxworthy in Philip. Journ. Sci. **2** (1907) Bot. 258. Plate XXIX, fig. 1.

A small tree 5–6 m tall, much branched, the branches terete, glabrous, gray or yellowish, branchlets very numerous, short, crowded toward the end of the branches. Leaves crowded toward the ends of the twigs, erect-spreading, often appearing subopposite on account of their contiguity, coriaceous, glabrous, smooth, shining, paler beneath and the younger ones very glaucous, oblong, elliptic-oblong or spatulate, 9–17 mm long, 3.5–5.5 mm wide, the apex rounded or obtuse, the base gradually narrowed and somewhat decurrent, midrib not prominent above, very prominent beneath, margins thickened; petioles broad, 1–2 mm long. Staminate spikes solitary in the upper leaf-axils, few, cylindrical, 1–1.5 cm long, 3 mm in diameter, densely many-flowered, glaucous when young. Pistillate flowers and fruit not seen.

MINDORO, Mount Halcon, *Merrill 5672*, Nov. 1906.
Borders of thickets on the margins of open heaths at 2,400 m altitude.

Sect. V. EUPODOCARPUS Endl.

Male flowers single or several, axillary, sessile, or several fasciculate at the apex of a peduncle, or disposed in an inflorescence; anthers usually densely imbricate, apiculus rarely wanting, usually ± developed. Female flowers single, axillary, subsessile or usually long-pedunculate; receptacle fleshy, always distinctly developed, often with 2 narrow bracts at the base; ovules 1 or 2. Seeds ovoid or globose, often with the apex obtusely produced; testa with its inner coat slightly thickened, never thickly woody. Leaves scattered, linear or lanceolate, often quite elongate.

5. **Podocarpus brevifolius** (Stapf) Foxworthy comb. nov.
P. neriifolius Don var. *brevifolia* Stapf in Trans. Linn. Soc. Bot. II 4 (1894) 249; Pilger l. c. 93. Plate XXIX, fig. 2.

Small trees of the upper part of the mossy forest. Leaves densely crowded on the twigs, 1.2–3.5 cm long, 4–7 mm wide, elliptic with slightly thickened margins, acute at apex, base gradually narrowed, midrib distinct above and below.

Collected by Low and by Haviland at altitudes of from 3,330 to 3,630 m above sea level on Mt. Kinabalu in British North Borneo. Dr. Stapf thought it possibly an alpine form of *P. polystachyus* R. Br. Pilger, l. c. 93, thought it probably a distinct species. Dr. Stapf has kindly sent me fragments of the Kinabalu material and I am convinced that it is a distinct species of § *Eupodocarpus* and closely related to *P. pilgeri*.

This species has been collected twice in the island of Luzon. Both collections were made in December 1907 on Mt. Tapulao, Zambales. *For. Bur. 9511*, collected by Curran and Merritt, seems to match the type pretty closely. *Bur. Sci. 5002*, collected by Ramos, differs in having slightly longer leaves. Both collections were from an elevation of about 1,800 m above sea level.

6. **Podocarpus pilgeri** Foxworthy in Philip. Journ. Sci. 2 (1907) Bot. 259.
P. celebicus Warburg, Monsunia 1 (1900) 192; Pilger l. c. 78, non *P. celebicus* Hemsl. in Kew Bull. (1896) 39.

Small trees in the mossy forest of mountain tops. Branches few or opposite, short, spreading, quite densely foliate; bud-scales ovate-lanceolate, acute or the outer ones long-acuminate. Leaves spreading, coriaceous, nitidulous, narrowly to broadly elliptic, apex abruptly rounded, obtuse or very shortly obtuse-mucronulate, abruptly narrowed below into the petiole, 3.5–5.5 cm long, 10–12 mm broad, midrib narrowly obtusely prominent above, broad and prominent below. Staminate flowers unknown. Fruit ovoid, 8–10 mm long, on a fleshy receptacle which has two minute subulate bracts at the base.

MINDORO, Mount Halcon, at 2,150 m alt., *Merrill 5754*, Nov. 1906: NEGROS, Mount Canlaon, at 1,450 m alt., *Phil. Pl. 241 Merrill*, Apr. 1910. MINDANAO, Mount Malindang, at 2,790 m alt., *For. Bur. 4678 Mearns & Hutchinson*, May 1906.

First collected by Warburg in the mountain forest on Wawo-Kraeng in Celebes.

7. **Podocarpus costalis** C. Presl Epimel. Bot. (1851) 236 pro parte (Spec. Haenke) excl. syn. Brown et Blume et Cuming 803; F.-Vill. Noviss. App. (1880) 211; Miq. Fl. Ind. Bat. 2 (1859) 1074; Ceron Cat. Pl. Herb. (1892) 187; Warburg, Monsunia 1 (1900) 193; Pilger in Engler Das Pflanzenreich 4⁵ (1903) 78.

P. sp. aff. *costalis* Presl; Vidal Sinopsis Atlas (1883) xliii, *t.* 97, *f. D.*

Tree, 5–15 m tall. Branches few, short, spreading, densely above. Leaves turned in all directions, spreading or erect-spreading, coriaceous, narrow or broadly linear-lanceolate, of uniform width almost to the apex, which is abruptly rounded, obtuse, gradually changing at the base into the short rather broad petiole, shining above, on drying ± fuscous above and below, 5–7 cm long, 10–12 mm broad or 3–4.5 cm long and about 6 mm broad or much larger in leaves from robust seedling plants, midrib scarcely conspicuous above or in a broadish, irregular obtuse ± prominent furrow, beneath broadly marked, but scarcely or but little prominent, irregularly slightly impressed in drying. Male inflorescence single, sessile, thick, cylindraceous, base surrounded by a rigid, short, obtusely-rounded bract, 3 cm long. Female inflorescence single, axillary; peduncles about 2 mm long; receptacle fleshy, scales 2, subequal, connate at apex, forming a fleshy rounded apex, about 7 mm long, with 2 very small bracts at the base. Seed elliptical, apex slightly obtusely produced, in drying fusco-nigrescent, 9–10 mm long.

Known only from the Philippines. First collected by Haenke, probably on Mt. Banajao, in the island of Luzon, from which come all the other collections of this species, *Loher 2140, 7128*, 1906; *Bur. Sci. 2393, 2423 Foxworthy*, Mar. 1907, *For. Bur. 7913 Curran & Merritt*, Nov. 1907.

8. **Podocarpus polystachyus** R. Br. ex Mirb. in Mém. Mus. 3 (1825) 75 (nomen) et ex Bennett in Horsf. Pl. Jav. Rar. (1838) 40 (nomen !); Endl. Syn. (1847) 215; Carr. Conif. (1867) 662 (?); Parl. in DC. Prodr. 16² (1868) 515; Merr. in Philip. Journ. Sci. 3 (1908) Bot. 394; Pilger in Engler Das Pflanzenreich 4⁵ (1903) 79.

P. neriifolia Don p. parte in Lamb. Pin. ed. 2, 2 (1828) 122.

I can not be sure that this species is distinct from *P. elatus* R. Br.

The following description is taken from Pilger, with the exception of what is said concerning the seed, which is taken from our Palawan material.

Tree; branches many subverticellate, erect-spreading, densely leaved toward the apex; bud-scales narrow, rigid, acuminate. Leaves rigid coriaceous, shining above, narrowly lanceolate or lanceolate, apex abruptly narrowed, obtusish or acute, or long-acuminate, acute, narrowed at the base into a short petiole, 4–7 cm long, 5–9, rarely 11–12 mm broad, middle portion usually slightly plicate above on drying, midrib narrow and prominent above, below broadish scarcely prominent. Male catkins several (3–5) fasciculate-sessile, surrounded at the base by small broad scales, spreading, ± curved, 2.5–3 cm long; anthers apiculate, broadly triangular-ovate, acutish or obtuse, slightly lacerate. Female flowers single; peduncles 3 to 6–7 mm long; receptacle fleshy, squamae 2, quite connate, apex very short, acute, fleshy, free, 10 mm long, 2–3 mm broad, upper squama forming a long carpidium; receptacle with 2 caducous scales at the base, tennous, subulate; ovule ovoid, apex slightly obtusely produced. Mature seed more or less globose, about 10 mm in diameter.

All of our material is from female plants or sterile. BATANES ISLANDS, *Bur. Sci. 3586 Fénix*, May 1907. LUZON, Province of Tayabas, *Bur. Sci. 13202 Foxworthy & Ramos*, Mar. 1911. BUCAS ISLAND, *Merrill 5268*, Oct. 1906. PALAWAN, *Vidal 3911*, *For. Bur. 3854 Curran*, Mar. 1906, *Bur. Sci. 904 Foxworthy*, May 1906.

This tree is found in rocky places on the beach or in rocky river beds not much above sea level. It is the only representative of the family found at sea level in the Philippines.

I collected this same form on the rocky beach of the Island of Satang Basa, just off the coast of Sarawak in June 1908 (*Foxworthy 417*).

Monsoon region: Singapore; Sumatra; Java; Borneo; and the Philippines.

9. **Podocarpus neriifolius** Don in Lamb. Pin. (1824) 21; ed. 2, 2 (1828) 122 ex parte (inclusus *P. polystachyo* et *P. rumphii* !); Spreng. Syst. Veg. 3 (1826) 889; Endl. Syn. (1847) 215; Carr. Conif. (1867) 661; Parl. in DC. Prodr. 16^{2} (1868) 514; Bot. Mag. *t. 4655;* Brandis, For. Fl. (1874) 541; Hook. f. Fl. Brit. Ind. 5 (1888) 649 (excl. syn. *P. polystachya*); Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26 (1902) 548; Perk. Frag. Fl. Philip. (1904) 44; Pilger in Engler Das Pflanzenreich 4^{5} (1903) 80; Koorders & Valeton, Bijd. Ken. Boomsort. Java 10 (1904) 265; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 24; Foxworthy ex Merr. in Philip. Journ. Sci. 2 (1907) Bot. 258; Koorders-Schumacher, Syst. Verz. Herb. Koord. 3 (1911) Taxaceae 4.

P. bracteata Blume Enum. Pl. Jav. (1827–28) 88; Rumphia 3 (1847) 214, *t. 172, f. 1;* De Boer, Conif. Archip. Ind. (1866) 16.

P. neglecta Blume Rumphia 3 (1847) 213; De Boer l. c. 21.

P. junghuhniana Miq. Pl. Jungh. 1 (1851) 2; Vidal Sinopsis Atlas (1883) xliii, *t. 97, f. C.*

P. leptostachya Blume Rumphia 3 (1847) 214; De Boer l. c. 19.

P. discolor Blume Rumphia 3 (1847) 213; De Boer l. c. 23.

P. macrophylla var. *acuminatissima* Pritzel in Engl. Bot. Jahrb. 29 (1900) 213.

Nageia neriifolia O. Ktze. Revis. Gen. Pl. 2 (1891) 800.

Tree to 25 m tall; very much branched with wide-spreading branches; buds ovoid with coriaceous scales, which are long ovate-acute or long caudate-acuminate. Leaves scattered, approximating verticillate, spreading, coriaceous, often ± falcate, lanceolate or narrowly lanceolate, upwardly distinctly narrowed, 7–15 cm long and 9–13 mm broad, in young specimens to 25 cm long and to 17–19 mm broad, midrib prominent above in a narrow furrow, below broadish, prominent. Male catkins narrowly cylindrical, 2.5–5 cm long, especially spreading or pendulous, single or 2 or 3 fasciculate, sessile, surrounded at base by numerous rigid, thick, coriaceous, or upwardly more tenuous, broad, obtuse or acute scales; anthers narrowly apiculate, short, acute or obtusish. Female flowers solitary; peduncles 12–20 mm long; receptacle fleshy, scales 2 unequally long, connate, apex obtuse fleshy, acutish, 9 mm long, 3 mm broad, 2 subulate bracts at base, tenuous, deciduous, to 5 mm or more in length; ovule single, ovoid, apex slightly obtusely produced. Seeds 12–16 mm long, narrowly ovoid, upwardly slightly attenuate, rotundate, slightly inequilateral, testa thick, coriaceous-fleshy, integument and epimatium equally developed; receptacle dilated beneath the seed, broadly cylindrical, 11 mm long, 9 mm broad.

LUZON, Province of Tayabas, *Merrill 1992, Hagger*, April 1903: POLILLO, *Bur. Sci. 10779 McGregor*, Nov. 1909. MINDORO, *Merrill 5768*, Nov. 1906.

Var. **brevipes** Blume l. c.

Leaves narrower and thicker. Peduncle of female flower equaling the length of the receptacle. Seed ellipsoid-globose.

The following numbers are of rather doubtful determination; but I am placing them here for the present.

LUZON, Province of Abra, *Bur. Sci. 7286 Ramos:* Subprovince of Benguet, *Loher s. n., For. Bur. 10826, 10894 Curran, For. Bur. 14189 Merritt, For. Bur. 14422 Darling.* MINDORO, *Merrill 5615, For. Bur. 11408 Merritt.*

All of our material has been collected in the mountains.

Distribution: Monsoon region and central Asiatic region: Nepal; Khasia; Jowai; China; Java; Sumatra; Borneo; Celebes; Moluccas; New Guinea; Malay Peninsula; Philippines.

10. **Podocarpus philippinensis** sp. nov. Plate XXX.

Arbor 20–30 m alta, cortice plano; rami erecti, teretiusculi; gemmae ramulorum globosae perulis ovatis, crassis, acutiusculis. Folia erecta vel erecto-patentia, coriacea, lanceolata, recta vel subfalcata, superne acuta, inferne sensim in petiolum brevem, crassiusculum angustata, 13–17 cm longa, 9–18 mm lata. Flores masculi ignoti. Flores feminei solitarii; pedunculus 5–8 mm longus; receptaculum carnosum, squamis 3 efformatum. Semina ellipsoidea-globosa, glauca.

Large straight trees, 20–30 m tall, with smooth reddish-brown flaky bark. Leaves long, linear-lanceolate, acute, more or less abruptly narrowed to the base, 13–17 cm long, 9–18 mm wide. Staminate flowers unknown. Fruit on a slender peduncle 5–8 mm long, two minute bracts at base of receptacle. Receptacle swollen, fleshy, bright-red, sometimes eaten, sometimes wider than the fruit when fresh, when dry 8–10 mm long and 4–8 mm thick, of a dull brownish or dark-blue color, made up of three scales which are found to contain some resin when dry. Seed globose, fleshy, 13–15 mm long, glaucous, with a thin hard shell.

I am not at all sure that this form is distinct from *P. rumphii*; but the description of that species is so unsatisfactory that it has seemed best to describe this as a new species. It seems to differ from *P. rumphii* in its bark and shorter peduncles and in having a rather more gradual narrowing of the leaf-blade toward the petiole.

A tree that is found on lower ridges of some of our mountains from 300 to 800 meters above sea level.

LUZON, Province of Bataan, Limay Peak, *Bur. Sci. 5174 Foxworthy &*
Apr. 1908 (type), *Bur. Sci. 10844 Foxworthy*, Nov. 1909, *For. Bur. 17523 Curran*, Nov. 1909, *For. Bur. 17594 Curran*, Dec. 1909; slopes of Mt. Mariveles, *For. Bur. 6325, 6326 Curran*, Feb. 1907; *For. Bur. 7512 Curran*, Sept. 1907; *For. Bur. 8987 Curran*, Jan. 1908, *Bur. Sci. 1660 Foxworthy*, Oct. 1906, *Whitford s. n.*, Apr. 1905, *For. Bur. 2743 Borden*, Mar. 1905: Province of Pampanga, Mt. Arayat, *For. Bur. 17664, 17723 Curran*, Mar. 1910.

Some of these forms have distinctly wider leaves than the rest; but I can see no other difference and can see no reason for putting them in more than one species.

11. **Podocarpus rumphii** Blume Rumphia 3 (1847) 214; De Boer, Conif. Archip. Ind. (1866) 15; Carr. Conif. (1867) 663; Parl. in DC. Prodr. 16^{2} (1868) 515; Beccari, Malesia 1 (1878) 179; Warburg, Monsunia 1 (1900) 192; Pilger in Engler Das Pflanzenreich 4^{5} (1903) 81; Foxworthy ex Merr. in Philip. Journ. Sci. 2 (1907) Bot. 258.

Lignum emamum Rumphius, Herb. Amb. 4 (1744) 47, *t. 26*.

Tree 20–25 m tall, crown pyramidal, bark fissured; branches erect, terete; buds of twigs globose, with ovate scales, acutish. Leaves erect or erect-spreading, coriaceous, lanceolate, straight or subfalcate, upwardly shortly narrowed and ± subcaudate-acuminate, rarely almost uniformly long-acuminate, acute, below abruptly narrowed into a short thick petiole, 15–25 cm long, 15–29 mm broad, midrib obtusely prominent above, the middle line more elevated, acutely marked, below broad, ± prominent. Male flowers unknown. Female flowers solitary; peduncle 2.5 cm long, receptacle fleshy, composed of 3 scales. Seeds 1 or 2, ellipsoid-globose, greenish when immature, chalybeous when mature.

LUZON, Province of Bataan, *For. Bur. 6537 Curran*, Apr. 1907: Province of Pampanga, *Merrill 3917*, Oct. 1904. MINDORO, *For. Bur. 6790 Merritt*, Apr. 1907, *Merrill 5553*, Nov. 1906.

Monsoon region: New Guinea; Moluccas; Celebes; Philippines.

PHYLLOCLADUS [1] L. C. & A. Rich.

Flowers monoecious or dioecious. Male flowers cylindraceous, pedicellate, fasciculate at the apex of a branch; anther-cells 2, dehiscent by a longitudinal fissure, apiculus small. Female flowers single in the axils of scales at the base of undeveloped branches, back of excrescences, pedicellate, or sessile on phylloclades or occupying cavities in phylloclades; carpidia uniovulate decussate or spirally arranged, thick, apex truncate, forming with the fleshy axis hollows of the shape of the ovules; ovules erect, the base at last surrounded by a lobulate, white cupule equaling the seed or surpassing the smaller seeds. Leaves very short squamiform, spirally arranged on the branches, in the axils of terminal branchlets resembling leaves, i. e. phyllocladia, rudimentary leaves arranged on the margins, the upper part variously lobed, pitted.

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[1] One of the *nomina conservanda* of the Vienna Congress.

There are 5 or 6 species in the genus and one of these is found in the high mountains of the Philippines.

Phyllocladus protractus (Warb.) Pilger in Engler Das Pflanzenreich 4^{5} (1903) 99; Perk. Frag. Fl. Philip. (1904) 44; Foxworthy ex Merr. in Philip. Journ. Sci. 2 (1907) Bot. 259. Plate XXXI.

P. hypophyllus Rendle in Journ. Bot. 34 (1896) 355 non Hook. f. in Hook. Icon. Pl. (1852) *t. 889.*

P. hypophyllus var. *protracta* Warb. Monsunia 1 (1900) 194.

Buds of branches globose, inner scales imbricate, shortly acute, outer scales long, subulate-acuminate, divaricate, rarely all shortly acute. Leaves on the branches at the base of the phylloclades, squamiform, deciduous, linear, very small. Phylloclades rather distant, large, narrowly elliptic or ovate, apex long attenuate, shining above, below slightly fuscescent, cuneate narrowed from about one-third the length to the base, or base almost ovate-rounded, the upper part with dentate lobes, the apex itself obtuse deeply incised, terminal lobe narrow, elongate, obtuse, or deeply sinuate, rarely irregularly grossly crenate; lobes of phylloclades slightly crenulate, bearing setaceous-dentiform, acute, rudimentary leaves; phylloclades 4–6 to 10.5 cm long, up to 4 cm broad; midrib prominent above, the place of lateral nerves taken by narrow furrows. Male catkins 5–7 mm long and 2 mm in diameter on pedicels of about the same length or shorter. Female flowers in sinuses at the apex of the phylloclades or at the sides or even taking the place of the phylloclades at the end of a branch; flowers subglobose, carpidia few. Seed smooth, compressed, with acute margins, apex rounded, obtuse; cupule short, white, shorter than the seed, scarcely projecting beyond the carpel.

LUZON, Province of Isabela, *For. Bur. 18567 Alvarez:* Subprovince of Lepanto, *For. Bur. 10957 Curran*, Jan. 1909, with flowers: Province of Abra, *For. Bur. 14587 Darling:* Subprovince of Benguet, *Loher 5203*, *Merrill 4753*, *For. Bur. 18364 Alvarez*, Jan. 1909, in fruit. MINDORO, *Merrill 5788*. MINDANAO, Province of Misamis, *For. Bur. 4679 Mearns & Hutchinson.*

Found in all the above cases at elevations greater than 1,000 m.

This species is said to differ from *P. hypophyllus* by its more incised phylloclades and by the fact that it is never glaucous on the under side of the phylloclades.

Distribution: Monsoon region: Philippines; Moluccas; British New Guinea.

4. TAXUS L.

Flowers dioecious; male axillary, squamate at the base; anthers 6–14, peltate, 6–8 cells together with connate filaments. Female flowers axillary on squamate branchlets; flower located in the axil of the uppermost scale, involucre of three equal decussate scales; buds containing 1–3 rudimentary leaves, rarely in flowering projecting from the next to the last scale of the twig; single ovule in terminal flower erect; seed ellipsoid, testa woody, cupule campanulate, closed, red, thickly fleshy; embryo placed in the upper part of the albumen, cotyledons 2, thick, pressed together. Trees or very much branched shrubs; leaves linear, spirally inserted, biseriate-spreading.

Pilger recognizes only a single species; but it seems to me that his subspecies are really good species and I am so treating them.

Taxus wallichiana Zucc. in Abh. Bayr. Akad. Wiss. 3 (1843) 803, *t. 5*; Endl. Syn. (1847) 244; Carr. Conif. (1867) 740.

T. baccata subsp. *wallichiana* (Zucc.) Pilger in Engler Das Pflanzenreich 4^5 (1903) 112; Perk. Frag. Fl. Philip. (1904) 44; Merr. in Philip. Journ. Sci. 5 (1910) Bot. 324.

T. virgata Wall. ex Hook. f. Fl. Brit. Ind. 5 (1888) 648.

T. contortus (?) Griff. Not. (1848) 351; Icon. Pl. As. *t. 376*.

T. baccata Hook. f. Fl. Brit. Ind. l. c.

Cephalotaxus sumatrana Miq. Fl. Ind. Bat. 2 (1859) 1076.

Cephalotaxus celebica Warb. Monsunia 1 (1900) 194.

Branches laxly leafy; scales of buds at the base of persistent branchlets larger, more rigid and more acute than in *T. baccata*. Leaves more or less falcate, narrowly linear, and base usually strongly curved, apex twisted, gradually long-acuminate, acute, 2.5–3 cm or more long, rarely in flowering specimens less than 2 cm.

LUZON, Subprovince of Lepanto, *Merrill 4595, Micholitz s. n., For. Bur. 10958 Curran:* Subprovince of Benguet, *Loher 4850, Elmer 6244, Williams 1002, Merrill 4814, For. Bur. 5015, 10824, 10830 Curran, Mearns s. n., Bur. Sci. 4406 Mearns, For. Bur. 14186, 14191 Merritt, For. Bur. 18106 Curran, Merritt, & Zschokke, For. Bur. 18366, 18369 Alvarez, Bur. Sci. 8390 McGregor:* Provinces of La Laguna and Tayabas, Mount Banajao, *Vidal 3907 Loher 7129, 7139, Bur. Sci. 2431 Foxworthy, For. Bur. 7914 Curran & Merritt, Bur. Sci. 6059, 9823 Robinson, Calvin 315.*

Rendle[4] credited a sterile specimen collected by Whitehead in the highlands of Lepanto to *Cephalotaxus mannii* Hook. f., but later it was referred to this species.

All of our material has been collected at elevations in excess of 1,500 m.

Where this species occurs, it makes up a very considerable part of the stand.

Distribution: Sikkim; Darjeeling; Manipur; Khasia; Burma; Sumatra; South Celebes; Philippines.

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[4] Journ. Bot. 34 (1896) 355.

PINACEAE.

This family is represented, in the Philippines, by but two genera, which are readily distinguished as follows:

Branchlets of but one sort; leaves broad and alternate or opposite........ 1. *Agathis*
Branchlets of two sorts; leaves cylindrical and clustered in a sheath........ 2. *Pinus*

1. AGATHIS Salisb.[*]

Flowers dioecious, rarely monoecious; axillary or the pistillate terminal. Staminate flower-clusters oval-lanceolate; stamens numerous, with 5–15 rather long pollen-sacs, and broad, oval, terminal scales. Cones crowded, spherical-ovoid, finally deciduous; receptacle broadly scale-shaped, leathery, imbricate. Seeds free, winged on one or both sides; cotyledons 2. Large evergreen resinous trees. Leaves on the main axis turned in all directions, on the twigs more or less in two planes and often opposed in pairs, broad, smooth, drawn together at the base to form a petiole, leathery, with numerous fine longitudinal nerves. Buds scaly. Time of ripening of fruit 2 years.

About 4–6 species in the East Indies, Malay Islands, the Philippines, Fiji, New Zealand, and northeastern Australia.

Agathis alba (Lam.) Foxworthy in Philip. Journ. Sci. **5** (1910) A, 173; Jeffrey in Ann. Bot. **20** (1906) 387 (nomen); Whitford, Philip. For. Bur. Bull. **10** part 2 (1911) 25, *pl. 1;* Koorders-Schumacher, Syst. Verz. Herb. Koord. **3** (1911) Pinaceae [1.]

Dammara alba Rumphius in Herb. Amb. **2** (1741) 174, *pl. 57;* Lamarck, Encycl. **2** (1786) 259; Blume, Rumphia **3** (1847) 211; Miq. Fl. Ind. Bat. **2** (1859) 1070; Parl. in DC. Prodr. $\mathbf{16}^{2}$ (1868) 374; Beccari, Malesia **1** (1879) 180.

Pinus abies Lour. Fl. Cochinch. ed. Willd. (1793) 579.

Agathis loranthifolia Salisb. in Trans. Linn. Soc. Bot. **8** (1807) 311; Blanco Fl. Filip. ed. 2 (1845) 528, ed. 3 (1879) 170; F.-Vill. Noviss. App. (1883) 211; Vidal Sinopsis Atlas (1883) xlii, *pl. 98, f. A;* Rev. Pl. Vasc. Filip. (1886) 295; Phan. Cum. Philip. (1885) 160; Ceron Cat. Pl. Herb. (1892) 188; Ahern Imp. Phil. Woods (1901) 7; Merr. in Philip. Bur. Govt. Lab. Publ. **27** (1905) 82.

Abies dammara Poir. Encyc. Suppl. **5** (1817) 35.

Dammara orientalis Lamb. Pinet. ed. 2 (1824) 70; Endl. Conif. (1847) 189; Carr. Conif. (1853) 425; Gord. Pinet. (1858) 79; Henk. et Hochst. Nadelhölz. (1865) 210.

Agathis dammara Rich. Commentatio bot. de Coniferis et Cycadeis (1826) 83, *t. 19;* Eichler in E. & Pr. Pflanzenfam. $\mathbf{2}^{1}$ (1889) 67, *f. 25.*

Dammara rumphii Presl Epim. Bot. (1851) 236.

Podocarpus phillippeanus Benth. ex Parl. in DC. Prodr. $\mathbf{16}^{2}$ (1868) 375.

Agathis philippinensis Warb. Monsunia **1** (1900) 185; Perk. Frag. Fl. Philip. (1904) 36; Merr. in Philip. Journ. Sci. **1** (1906) Suppl. 24; Philip. Journ. Sci. **2** (1907) Bot. 257.

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[*] One of the *nomina conservanda* of the Vienna Congress.

Dammara celebica Koord. in Meded. 's Lands Plant. 19 (1898) 263.
Agathis borneensis Warb. l. c. 184.
A. beccarii Warb. l. c. 184.
A. celebica (Koord.) Warb. l. c. 185.
A. macrostachys Warb. l. c. 185.

Very large trees, up to 50–60 m in height and more than 2 m diameter, with a clear length, sometimes, of as much as 30 m. This is easily the largest tree in the Islands. It occurs gregariously in the mountain forests at elevations of from 200 to 2,000 m, attaining its best development in the Philippines on well-drained slopes at 600–1,500 m.

The bark is rather smooth, of a grayish color, 1–1.5 cm thick and contains numerous longitudinal resin-cavities. Resin collects on the surface of fresh cuts, and hard resin is found in masses wherever there is an old wound on the tree, often in the forks of the lowermost branches and sometimes also in the roots and the ground at the base of the tree. This resin is collected and exported as the Manila copal of commerce.

Leaves thickly coriaceous, of the same color on both surfaces, light-green, without distinct midrib, elliptic, oblong, or lanceolate, usually rounded or obtuse at apex, but sometimes even acute, narrowed abruptly below into a short petiole, with numerous fine, parallel, longitudinal veins; 3–10 cm long or even longer on seedlings or young shoots, 1–4 cm wide or less than 1 cm wide on old or fruiting branches. On seedlings and young shoots the leaves are often distinctly lanceolate, sometimes acute at apex and relatively quite large; on old branches or fruiting branches the leaves are much smaller and are often elliptic or oblong and distinctly obtuse or rounded at the apex. There is a great range of variation and all intermediate forms are found between the two extremes noted. The staminate flower-clusters are more or less elliptic-oblong, of various size, up to 4–5 cm long and 1–1.5 cm in diameter, and are borne in the axils of the leaves. The pistillate flowers are in ellipsoid-globose cones which are borne on short stout branches. The cones take 2 years to come to maturity. They are often of a purplish color and may be as much as 4–5 cm in diameter during their first year, reaching a diameter of 10 cm or more when mature. The seeds may be found with or without wings.

LUZON, Province of Cagayan, *For. Bur. 17183 Curran:* Subprovince of Lepanto, *For. Bur. 5670 Klemme:* Province of Abra, *For. Bur. 14599 Darling:* Subprovince of Benguet, *For. Bur. 10855 Curran, For. Bur. 14196, 18018 Merritt:* Province of Nueva Ecija, *For. Bur. 22181 Alvarez:* Province of Zambales, *For. Bur. 7009 Curran, For. Bur. 9508 Curran & Merritt:* Province of Bataan, *Williams 398, 755, Merrill 3759, Whitford 240, 297, For. Bur. 796, 805 Borden, Dec. Phil. For. Fl. 163 Borden, Bur. Sci. 1664 Foxworthy, For. Bur. 12901 Alvarez:* Province of Rizal, *Loher 7127:* Province of Camarines, *For. Bur. 10465 Curran, For. Bur. 14278 Aguilar:* Province of Albay, *Cuming 906, For. Bur. 6685 Pray:* Province of Sorsogon, *For. Bur. 6684 Pray, For. Bur. 10602 Curran.* MINDORO, *For. Bur. 8718, 11430 Merritt.* SIBUYAN, *McGregor s. n.* NEGROS, Province of Negros

Occidental, *For. Bur. 3234 Burgess*, *For. Bur. 4544 P. del Villar*. PALAWAN, *Merrill 749*, *Celestino s. n.*, *For. Bur. 3505 Curran*, *For. Bur. 5189 Manalo*. MINDANAO, Province of Misamis, *For. Bur. 4668 Mearns & Hutchinson:* District of Davao, *Copeland 1162:* District of Zamboanga, *Copeland s. n.*

Distribution: Cochin China; Malay Peninsula; Sumatra; Java; Celebes; the Moluccas; Borneo; and the Philippines.

Native names: *Almaciga*, *baltic* (Tagbanua), *saleng* (Neg.).

The following species have been mentioned by various authors as occurring in the Philippines; but they are found only in cultivation and can not be considered as properly belonging to our flora:

ARAUCARIA EXCELSA R. Br., F. Vill. Noviss. App. (1880) 211.

CUPRESSUS TORULOSA Don, F. Vill. l. c. 211.

JUNIPERUS OCCIDENTALIS Hook., Usteri, Beitr. Kenn. Phil. Veg. (1905) 134.

2. PINUS L.

Branches of two kinds; the leaves clustered in a sheath; fruit a cone.

A genus of about 70 species, mainly in the north temperate zone. A few species are found in mountainous regions in the tropics. A single species, *P. merkusii*, crosses the equator.

Sect. I. PINASTER Endl.—Apophysis of cone-scales (i. e. the special visible end portion when the cone is closed) more or less pyramidal with a central portion (umbo), which sometimes develops a point (mucro).

§ 1. *Pinea*.—Needles two, rarely 1 in shortened branches (therefore half cylindrical) — Some 20 species throughout the range of the genus. 1. *P. merkusii*

§ 2. *Taeda*.—Needles 3 (therefore 3-angled)—About 16 species principally in North America and the East Indies.. 2. *P. insularis*

1. **Pinus merkusii** Jungh. & De Vr. in Plant. Nov. Ind. Bat. Orient. (1845) 5, *t. 2;* Endl. Syn. Conif. (1847) 176; Carr. Conif. (1853) 380; Gord. Pinet. (1858) 169; Henk. & Hochst. Nadelhölz. (1865) 43; Miq. Fl. Ind. Bat. 2 (1859) 1069; De Boer Conif. Archip. Ind. (1866) 5; Parl. in DC. Prodr. 16² (1868) 389; F.-Vill. Noviss. App. (1880) 211; Vidal Sinopsis Atlas (1883) xliii, *t. 98, f. B;* Rev. Pl. Vasc. Filip. (1886) 296; Ceron, Cat. Pl. Herb. (1892) 188; Merr. in For. Bur. Bull. (Philip.) 1 (1903) 15; Bur. Govt. Lab. Publ. (Philip.) 6 (1904) 6; Perk. Frag. Fl. Philip. (1904) 35; Whitford, Philip. For. Bur. Bull. 10 part 2 (1911) 26.

P. sumatrana Jungh. Bot. Zeit. 4 (1846) 698.

P. finlaysoniana Wall. Cat. no. 6062; Blume Rumphia 3 (1847) 210.

P. sylvestris Finlays. in Lour. Fl. Coch. ed. Willd. (1793) 709, non L.

Medium-sized or large trees, said to grow to a height of 25 m or more and a diameter of 70–90 cm, crown pyramidal, bark thick, brownish or ashy in color and fissured. Young branches incurved ascending. Leaves in adult state 18–25 cm long, 1 mm or less broad, dorsally convex and ridged when dry, ventrally concave, stomata in parallel lines, enclosed in a scarious persistent transversely wrinkled sheath for about 2 cm at base. Staminate aments scattered among the leaf buds, 18–20 mm long, about 3 mm in diameter, straight or curved, obtuse, densely flowered, antheriferous bracts suborbicular, denticulate. Cones solitary, on short erect branches, maturing in the second year, 5–8.5 cm long, 1–5 cm in diameter, usually attenuate ovate. Cone scales woody, oblong, 12–23 mm long, 7–9 mm broad, slightly convex without, within subexcavate at the base to receive the seed, apex thickened shining, center of apophysis depressed and from the center to the circumference foveate-striate; seed inserted toward the base of the scale, wing oblong knife-shaped 14 mm long, about 4 mm broad, pale-yellow, pellucid. Cotyledons usually six, very short obtuse.

On well-drained dry ridges in Zambales and Mindoro. Mr. Merritt, who has very carefully studied the distribution of this species, says:[4] "Southwest of the high mountain chain stretching north and south from Mount Halcon is an area with a temperature considerably lower than that of sea level and with a well-drained and often extremely dry soil. Here conditions are right for the growth of pine (*Pinus merkusii*). This tree grows in pure stands and is found in open scattered groves along the higher ridges and slopes, sometimes extending well down toward sea level. This pine was observed at elevations as low as 60 m in the vicinity of Santa Cruz, the southern part of its range, while at its northern limits it was nowhere seen below 900 m. Ground fires annually burning over the grass which has crept in among these trees prevent the best of reproduction and keep the forest open." The latitude of the region referred to in Mindoro is from about 13° to about 13° 20′ N.

This species is represented in our herbarium by the following numbers:

LUZON, Province of Zambales, *Ahern 829*, *Russell*, July 1902, *Merrill 1158*, *Medina*, Jan. 1903, *Dec. Phil. For. Flor. 240 Maule*, Nov. 1904, with the following field note: "Grows in pure stand on heights some 15 kilometers east of Sta. Cruz, Zamb. Forest of irregular area covering as estimated 500 hectares. Soil is loose and impregnated with copper oxide giving a dark color. No undergrowth of trees other than pine exists and fires greatly retard reproduction so that seedlings are at present rarely found. Where growing in stands they are open resembling character of white pine (*P. strobus*) of U. S. Many trees growing more or less as individuals which fact seems due to influence of soil. No *P. insularis* occurs in this forest but it occurs at Botolan." *For. Bur. 8228 Curran*, Dec. 1907. MINDORO, *For. Bur. 8521, 8734a Merritt*, Jan. 1908, *For. Bur. 8830, 8831 Merritt*, Feb. 1908.

Native names: *salit, tapulao, aguu, agoo.*

Distribution: Burma; Cochin China; Sumatra; Java; Borneo; the Philippines.

2. **Pinus insularis** Endl. Syn. Conif. (1847) 157; Presl Epim. Bot. (1851) 37; Parl. in DC. Prodr. **16**² (1868) 390; F.-Vill. Noviss. App. (1880) 212; Vidal Sinopsis Atlas (1883) xliii, *t. 98, f. C;* Phan. Cum. Philip. (1885) 160; Rev. Pl. Vasc. Filip. (1886) 296; Ceron Cat. Pl. Herb. (1892) 188; Merr. in For. Bur. Bull. (Philip.) **1** (1903) 15; Perk. Frag. Fl. Philip. (1904) 35; Merr. in Bur. Govt. Lab. Publ. (Philip.) **6** (1904) 6; Philip. Journ. Sci. **5** (1910) Bot. 325; Whitford Philip. For. Bur. Bull. **10** part 2 (1911) 26, *pls. 2, 3.*

P. insularis x *P. merkusii* Perk. Frag. Fl. Philip. l. c. 35.

Pinus sp. Merr. in For. Bur. Bull. (Philip.) **1** (1903) 15.

P. taeda Blanco Fl. Filip. (1837) 767; Merr. in Bur. Govt. Lab. Publ. (Philip.) **27** (1905) 82, non L. Sp. Pl. (1753) 1419 ex parte.

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[4] The Forests of Mindoro. Philip. For. Bur. Bull. **8** (1908) 22.

P. khasya F.-Vill. Noviss. App. (1883) 212; Merr. in For. Bur. Bull. (Philip.) 1 (1903) 16; non Royle ex Gord. in Lond. Gard. Mag. 16 (1840) 8.
P. timoriensis Loud. ? Arb. Brit. 4: 2269.

Trees, 10–25 m tall and sometimes 75 cm in diameter. Leaves in clusters of three, surrounded by a rather chaffy and persistent sheath which is sometimes as much as 2 cm long but usually is much shorter. Leaves long, flaccid, compressed, 3-sided, with marginal resin-canals, 18–20 cm long, 0.6–1 mm broad. Male aments numerous, thick, dense, cylindraceous, obtuse, 18–22 mm long, 3.5–4 mm broad; antheriferous bracts suborbicular; anthers crested. Cones 2 or 3, verticillate, subterminal, the younger ones oblong on erect branches, the adults on short horizontal branches or subpendulous, ovate, conical, obtusely straight or curved, short stalked, deflexed, 5–10 cm long, 3–6.5 cm in diameter; falling when mature or persistent on the branches; cone-scales thick, with a tumid apophysis, which is broader than long, and an elliptic umbo. Meristele elliptic. Fibro-vascular bundle simple. Seed obovoid-conic with large wing which drops off as the seed dries. Wing clear, occasionally streaked or mottled with darker lines. Seed pale-straw-color or purplish, often of light color with splotches of brown or purple 5–7 mm long, 2.5–3 mm in greater and 1.5–2 mm in lesser diameter. Extreme length of wing 2 cm, extreme breadth of wing 8 mm. In order to get some idea of the range of variability in size and shape of cones, 115 adult cones from one locality in Benguet were measured. The length of these varied from 5 to 8.4 cm, the width (open) from 4 to 6.2 cm. The shape varied from narrowly cylindric-conic to broadly ovoid-conic. Cone scales occasionally with the apophysis prolonged forward into a more or less spiny point, or apophysis smooth in front. Umbo small, deciduous or sometimes persistent. The cones seem to take three years to mature.

This pine shows a striking resemblance in habit to *P. ponderosa* Dougl. of the western United States.

The wood is used a good deal locally in northern Luzon. The resin has been studied as a possible commercial source of turpentine; but it does not seem promising, because of the scattered nature of the stand. The tree is very common in the mountains of northern Luzon.

LUZON, **Province of Ilocos Sur**, ***For. Bur. 5652 Klemme*: Province of Abra**, ***Bur. Sci. 7113 Ramos*, *For. Bur. 14616 Darling*: Subprovince of Lepanto-Bontoc**, ***For. Bur. 11262 Klemme*, *For. Bur. 10969 Curran*, *Vanoverbergh 185*: Subprovince of Benguet**, ***Ahern 830, 831, 832, 833, Scheerer, Ahern 852, Lardizibal, Topping 122, 123, 124, Merrill 1160, 1161, 1162, 1163, 1164, 1165, Bryant, For. Bur. 978, 979 Barnes, Elmer 6390, Williams 1205, 989, For. Bur. 5068, 5144, 5145, 5203, 10842, 10872, 10918 Curran, Bur. Sci. 2827, 2865 Mearns, For. Bur. 9639 Zschokke, For. Bur. 18002, 18005 Merritt, For. Bur. 18065, 18186, 18202 Curran, Merritt & Zschokke, Bur. Sci. 8409, 8899 McGregor, Bur. Sci. 12908 Fénix*: Province of Pangasinan**, ***Bur. Sci. 8290 Ramos*: Province of Zambales**, ***Merrill 2116 Irey, Merrill 2978 Garcia, Dec. Phil. For. Fl. 76 Merrill, For. Bur. 7000*,**

7001 Curran, For. Bur. 8416, 8999, 9509 Curran & Merritt (Note with *8999*, "Height 80 feet, Diam. 20 in.; No. annual rings 100; merchantable length approx. 50 ft.; mature, 2 and 3 year old cones. New cones all stages. Male flowers. Very abundant forming pure stands. Tree cut on sample acre as average tree. Sample acre showed 50 sound and 21 unsound trees over 12 in. in diam. Largest tree 36 in. smallest tree 4 in. Very scanty reproduction, due mainly to fire"), *Bur. Sci. 4819, 5000 Ramos.*

Found at elevations of from 300 to 2,700 m.

Native names: *saleng, al-al, parua, balibo, boo-boo, bulbul, tapulao.*

Distribution: Philippine Islands and Timor.

Class VI. GNETALES.

Trunk simple or branched. Vascular bundles collateral. Vessels present in secondary wood. Leaves opposite, undivided. Flowers unisexual or apparently perfect, with perianth-segments united into a floral envelope and more or less enclosed by involucral bracts. Pistillate flowers with ovules of uniform size. Fruit structures rather various. Cotyledons 2. Resin-canals wanting.

GNETACEAE.

Subfamily GNETOIDEAE. The grown plants are generally woody climbers with a twining stem, more rarely erect bushes or trees. The round stems are swollen and jointed at the nodes, where are borne in decussating pairs the simple, stalked, feather-veined, exstipulate, evergreen leaves. In germination the cotyledons are carried up on a long hypocotyl, a lateral outgrowth (or sucker) of which remains in the seed and absorbs the endosperm for the benefit of the seedling. The flowers are generally dioecious and borne in axillary and terminal, simple or branched spikes, associated with the decussate-opposite bracts. The very numerous (to forty) male flowers are arranged in several whorls above each pair of bracts; the series terminates in a simple whorl of sterile female flowers. On the female spikes the flowers are arranged in whorls of three to eight. In both sexes they are surrounded at the base by numerous jointed hairs. The male flowers have a tubular perianth with a contracted mouth, which shows an indication of two lobes. The slender floral axis projects above it and terminates in two laterally placed sessile unilocular anthers with transverse dehiscence. Pistillate flowers with sack-like involucre. Ovule with two integuments, the second of which is absent from the sterile ovules in the male inflorescence. In the fruiting stage the perianth becomes fleshy and the outer integument woody, the whole having the appearance of a drupe. By cross and longitudinal divisions of the embryo-sac mother-cell there are developed several embryo-sac fundaments; a parietal standing layer of nuclei are developed and from one of these is developed the single embryo, after fertilization.

"The secondary wood contains numerous large vessels. Climbers, such as *Gnetum scandens,* resemble, in the mode of secondary thickening of the stem, *Cycas* and the climbing stems of *Menispermaceae* among the Dicotyledons, where the growth of the original ring of bundles ceases after a time, and a second ring is formed in the cortex, which is similarly followed by a third, and so on."[7]

A single genus, *Gnetum*, with about 20 species, in the tropics of both hemispheres.

I can distinguish but four Philippine species, two trees and two climbing vines. The common one is *Gnetum latifolium* Bl. which is found throughout the Malay region and which is doubtfully distinct from *G. scandens* Roxb. No authentic material of the latter species has been available to me, but the descriptions make the two species seem very much alike.

KEY TO PHILIPPINE SPECIES OF GNETUM.

a. Trees.
  b. Fruit sessile .... 1. *G. gnemon*
  bb. Fruit stalked .... 2. *G. arboreum*
aa. Climbers.
  b. Large vine, twigs coarse, leaves, or some of them, acuminate at apex; staminate flower cluster more than 15 mm in length.......... 3. *G. latifolium*
  bb. Slender vine, twigs fine, leaves not acuminate; staminate flower cluster not more than 15 mm in length.......... 4. *G. minus*

1. **Gnetum gnemon** L. Mant. **1** (1767) 125; Lam. Encycl. Meth. Bot. **2** (1786) 764; Willd., Sp. Pl. **4**^{1} (1787) 591; Blume, Tijd. Nat. Gesch. **1** (1834) 160; Roxb. Fl. Ind. **3** (1832) 518; Endl. Syn. Conif. (1847) 250; Blume, Rumphia **4** (1848) 3, *t. 176*, *t. 178 B, f. 5;* Miq. Fl. Ind. Bat. **2** (1859) 1067; Parl. in DC. Prodr. **16**^{2} (1868) 349; Vidal, Phan. Cum. Philip. (1885) 160; Rev. Pl. Vasc. Filip. (1886) 295; Hook. f. Fl. Brit. Ind. **5** (1890) 641; Ceron Cat. Pl. Herb. (1892) 187; Karsten in Ann. Jard. Bot. Buitenz. **11** (1893) 203; Koorders, Meded. 's Lands. Plant. **19** (1898) 265; Warburg, Monsunia **1** (1900) 195; Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. (1901) 156; Koorders & Valeton, Bijd. Ken. Boomsoort. Java **9** (1903) 349; Merr. in For. Bur. Bull. (Philip.) **1** (1903) 16; Bur. Govt. Lab. Publ. (Philip.) **27** (1905) 82; Philip. Journ. Sci. **1** (1906) Suppl. 24; Koorders-Schumacher, Syst. Verz. Herb. Koord. **3** (1911) Gnetaceae 1.

G. sylvestris Brongniart in Duperrey Voy. Bot. (1828) 12.

G. ovalifolium Poir. in Encycl. Suppl. **2** (1786) 810.

G. brunonianum Griff. in Lindl. Vegetable Kingdom (1840) 233, *f. 164;* Notulae **4** (1854) 30; in Trans. Linn. Soc. Bot. **22** (1859) 308; Beccari, Malesia **1** (1877) 183.

G. griffithii Parl. in A.DC. Prodr. **16**^{2} (1868) 349.

G. gnemon sylvestris F.-Vill. Noviss. App. (1883) 210.

G. gnemon laurinum F.-Vill. l. c. 210.

G. domestica mas Rumph. Herb. Amb. **1** (1750) 181–183.

G. domestica femina Rumph. l. c.

G. silvestris Rumph. l. c.

Mail-Ombi Rheede, Hort. Malab. **5** (1685) 51, *t. 26*.

Mala Elengi Rheede l. c. 109, *t. 55* ?.

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[7] From Rendle, Classif. of Flowering Plants **1** (1904) 123.

A large shrub or small tree, sometimes 10–15 m tall and 10–20 cm in diameter breast high. Bark light-colored, thin and finely fissured. Wood hard and heavy, pale-yellowish or whitish in color. Leaves small or large, coriaceous or chartaceous, greenish or yellowish-green in drying, very variable in size and shape, ovate-oblong or lanceolate, tapering to both ends or broader at the base; large specimens 11–18 cm long and 4–7 cm wide. Ripe fruit reddish, sessile, very variable in size and shape. The ripe fruit is commonly eaten, after cooking. The leaves are also cooked and eaten and the bark furnishes a strong bast fiber which is used in making cordage.

A tree of rather scattered occurrence but wide distribution in the lowland forests and on low ridges.

LUZON, Province of Bataan, *Merrill 2516*, *Williams 505*, *713*, *For. Bur. 178 Barnes*, *For. Bur. 614*, *637*, *2490 Borden*, *Whitford 1036*, *1078*, *1253*, *For. Bur. 2501 Meyer*, *Bur. Sci. 1601*, *1602 Foxworthy*: Province of La Laguna, *For. Bur. 10130 Curran*: Province of Tayabas, *Bur. Sci. 13197 Foxworthy & Ramos*. MINDORO, *Jose Nable 19*, *For. Bur. 6185 Merritt*. LEYTE, *Elmer 7087*, *7348*. MINDANAO, Province of Surigao, *Ahern 349*, *410 Quadras*: District of Zamboanga, *For. Bur. 9155 Whitford & Hutchinson*. PALAWAN, *Merrill 848*.

Native name: *Bago*. This same name is used for this plant in various parts of the Malay Archipelago.

Said to be cultivated throughout the Netherlands Indies and to have a large number of varieties. Africa; tropical Asia; Malay Peninsula; Java; Borneo; Celebes; Amboina; Moluccas; New Guinea; Pacific Islands; the Philippines.

2. **Gnetum arboreum** sp. nov. Plate XXXII.

Arbor 7 m altus, 10 cm diametro. Fructus pedicellatus.

A tree, 7 m tall and 10 cm in diameter. Leaves elliptic, acuminate at apex and cuneate at base, tapering into the slightly winged petiole which is canaliculate above, 5–9 cm long and 2.5–4.5 cm wide. Secondary veins 6–8, with connection of veins as in *G. latifolium* Bl. Fruit orange-red on short branch. In our material this branch is only 3.5 cm long with four internodes. Only two fruits are left on the type and these are each about 2.5 cm long and 17–18 mm in diameter, tapering at apex and base, small mucro at apex. Pedicels about 2 cm long.

The appearance of this form is what one might except if a small-leaved form of *G. latifolium* were to acquire the tree habit. Found at an elevation of more than 900 m, on Mt. Binuang in the former district of Infanta, Tayabas Province, Luzon.

Type: *Bur. Sci. No. 9439*, collected by C. B. Robinson, Aug. 28, 1909.

3. **Gnetum latifolium** Blume in Nov. Fam. (1833) 30, et in Hoev. & De Vriese, Tijd. Nat. Gesch. **1** (1834) 162; Rumphia **4** (1848) 5, *t. 174*; Endl. Syn. Conif. (1847) 251; Presl Epim. Bot. (1851) 236; Miq. Fl. Ind. Bat. **2** (1859) 1067; Parl. in DC. Prodr. **16^2** (1868) 350; Beccari, Malesia **1** (1877) 181; F.-Vill. Noviss. App. (1880) 210; Vidal, Sinopsis Atlas (1883) xlii, *t. 97*, *f. A*; Phan. Cum. Philip. (1885) 160; Rev. Pl. Vasc. Filip. (1886) 295; Ceron, Cat. Pl.

Herb. (1892) 187; Karsten in Ann. Jard. Bot. Buitenz. 11 (1893) 209; Koorders Meded. 's Lands Plant. 19 (1898) 265; Warburg, Monsunia 1 (1900) 195, 197; Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. (1901) 158; Koorders & Valeton Bijd. Ken. Boomsoort. Java 9 (1903) 352; Usteri, Beitr. Ken. Phil. Veg. (1905) 134; Merr. in Bur. Govt. Lab. Publ. (Philip.) 27 (1905) 82; Philip. Journ. Sci. 1 (1906) Suppl. 25; Koorders-Schumacher, Syst. Verz. Herb. Koord. 3 (1911) Gnetaceae 1.

Abutua indica Lour. Fl. Coch. 2 (1790) 630; Juss. in Lam. Encyc. Bot. Suppl. 1 (1810) 35. This is the oldest name; but I have not seen Loureiro's specimen.

Gnetum funiculare Blume Nov. Fam. (1833); Ann. Sci. Nat. II 2 (1834) 106; Tijdschr. Nat. Gesch. 1 (1834) 162, 4; Rumphia 4 (1848) 7; Miq. Fl. Ind. Bat. 2 (1859) 1068; Endl. Syn. Conif. (1847) 252; Parl. in DC. Prodr. 16 (1868) 351; Brongn. in Duperr. Voy. Bot. (1828) 12; Kurz in Flora 55 (1872) 350; For. Fl. 2 (1877) 496; Hook. f. in Fl. Brit. Ind. 5 (1888) 643; F.-Vill. Noviss. App. (1883) 211.

Thoa pendula Blanco Fl. Filip. (1837) 746.

Thoa edulis Blanco Fl. Filip. ed. 2 (1845) 514, non Willd. Sp. Pl. 4 (1805) 477.

G. philippinense Warburg, Monsunia 1 (1900) 196.

G. scandens Merr. in Bur. Govt. Lab. Publ. (Philip.) 8 (1903) 32, 114, 153; F.-Vill. Noviss. App. (1883) 211, non Roxb. Hort. Beng. (1814) 66.

Gnemon funicularis Rumph. Herb. Amb. 5 (1747) 12, *t.* 8.

Coarse woody vines of large size, climbing on trees in rather thick forest, from sea level up to about 600 m. Leaves membranous or chartaceous, usually becoming black in drying, oval or elliptic, acute, obtuse, acuminate or mucronulate at apex, rounded at base or narrowed into the short petiole which is sometimes winged at the side and canaliculate on its upper surface. Leaves 6–25 cm long, 2–10 cm wide; secondary veins usually 5–7 pairs, usually bending upward toward the edge of the leaf and uniting with other veins. I can not follow Karsten in classification by styles of venation. There is very great variation in size and shape of leaves upon the same plant. Male flower-clusters fasciculate or racemose, rarely solitary, terminal; 30–50 mm long, peduncles 8–20 mm long, flowers in many series of crowded whorls. Female inflorescences axillary, fasciculate, the whole inflorescence sometimes as much as 250 mm long, individual branches long-stalked, 50–80 mm long, of about 10–15 whorls of uniseriate flowers and with short internodes. Fruit orange-red, 25–30 mm long with a pedicel 5–8 mm long.

Fruit roasted and eaten. The inner coat, with its covering of hairs, has to be removed before the fruit is edible. The bast is used for cordage. This species is much sought as a source of drinking water in the forest. The vessels will flow a good quantity of fine clear water when a section is taken out of the trunk.

I am by no means sure that this species is distinct from *G. scandens* Roxb., but it is the form commonly referred to this species in the Malay region. *G. neglectum* Bl., which F.-Vill. credits to the Philippines is not given with any citation of specimens and it may be considered as probably not found in the Philippines, if indeed, it is distinct from this species.

LUZON, Province of Cagayan, *For. Bur. 7081 Klemme:* Subprovince of Benguet, *Elmer 8714, Bur. Sci. 12681 Fénix:* Province of Tarlac, *Loher 7135:* Province of Pampanga, *Merrill 1458 Garcia:* Province of Zambales, *Hallier s. n., For. Bur. 8158 Curran & Merritt:* Province of Bataan, *Williams 27, 543, Merrill 3158, For. Bur. 161 Barnes, For. Bur. 1805 Borden, Whitford 1236, For. Bur. 5464, 7374, 7375 Curran:* Province of Rizal, *Warburg 13491, Guerrero 29, Dec. Phil. For. Fl. 120 Ahern's coll., For. Bur. 2876 Ahern's coll., Bur. Sci. 100 Foxworthy:* Province of Batangas, *Cuming 1549:* Province of Tayabas, *For. Bur. 15055 Curran.* POLILLO, *Bur. Sci. 10341 McGregor.* MINDORO, *For. Bur. 4117, 11483 Merritt.* LEYTE, *Elmer 7346, For. Bur. 12793 Rosenbluth.* MINDANAO, District of Butuan, *Merrill 7304:* District of Davao, *Williams s. n.:* District of Lanao, *Mrs. Clemens 412, s. n., 691.* PALAWAN, *Merrill 747.*

Native name *culiat.* This same name is applied to this plant in various parts of the Netherlands Indies.

Distribution: British India and Burma, Cochin China, Sumatra, Java, Borneo, Celebes, the Moluccas, New Guinea.

4. **Gnetum minus** sp. nov. Plate XXXIII.

Scandens. G. scandenti (ex descr.) simile sed minus. Folia elliptica vel oblonga, 4.5–9 cm longa, 2–4 cm lata; amentis masculis 1–3, fasciculatis, cylindraceis, 6–14 mm longis, 3–4 mm latis. Amenta feminea ignota.

With rather slender twigs. Leaves elliptic or oblong, tapering to both ends, acute or obtuse at apex and more or less cuneate at base, tapering into the slightly winged petiole, which is sometimes canaliculate above; dark-green above, slightly lighter beneath, becoming very much darker, but not black, in drying, 4.5–9 cm long, 2–4 cm wide; secondary veins 5–8 pairs. Venation as in *G. latifolium;* margin of leaf slightly thickened or inrolled. Staminate flower-clusters terminal on short lateral branches, 1–3 in a cluster, each one 6–14 mm long and 3–4 mm in diameter, of 5–10 whorls. Peduncle 1–9 mm long. Pistillate flower-clusters and fruit not seen.

Collected by Dr. E. A. Mearns near Baguio, Subprovince of Benguet, Luzon, in April 1907, *Bur. Sci. 2513.*

Possibly only a small form of *G. latifolium.*

ILLUSTRATIONS.

PLATE XXVI.

FIG. 1. *Cycas circinalis* L. Immature ♀ cone. *Bur. Sci. 3281.* Photograph by Martin.

2. *Cycas circinalis* L. Immature ♂ cone. *Plant cultivated in Manila.* Photograph by Foxworthy.

PLATE XXVII.

Cycas sp. From Palawan. ♂ cone. *For. Bur. 3842.* Photograph by Martin.

PLATE XXVIII.

FIG. 1. *Dacrydium falciforme* (Parl.) Pilger. *For. Bur. 4425.* Photograph by Martin.

2. *Podocarpus blumei* Endl. *For. Bur. 147.* Photograph by Martin.

PLATE XXIX.

FIG. 1. *Podocarpus glaucus* Foxw. *Merrill 5672.* Photograph by Martin.

2. *Podocarpus brevifolius* (Stapf) Foxw. *For. Bur. 9511.* Photograph by Martin.

PLATE XXX.

Podocarpus philippinensis Foxw. *Bur. Sci. 5174.* Photograph by Martin.

PLATE XXXI.

Phyllocladus protractus (Warb.) Pilger. ♂ *For. Bur. 10957.* ♀ *For. Bur. 18364.* Drawn by T. S. Espinosa.

PLATE XXXII.

Gnetum arboreum Foxw. *Bur. Sci. 9439.* Drawn by T. E. Espinosa.

PLATE XXXIII.

Gnetum minus Foxw. *Bur. Sci. 2513.* Drawn by T. S. Espinosa.

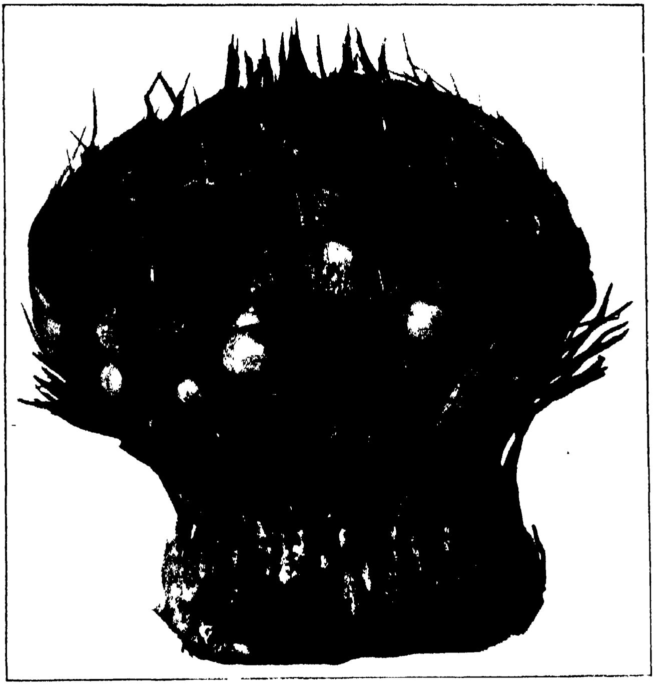


FIG. 1. CYCAS CIRCINALIS L.

Immature ♀ cone.

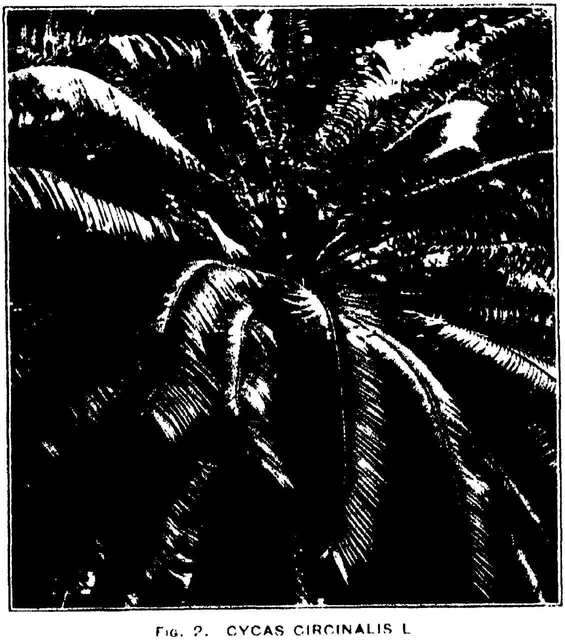


FIG. 2. CYCAS CIRCINALIS L.

Immature ♂ cone.

PLATE XXVI.

PLATE XXVII. CYCAS SP.

♂ cone.

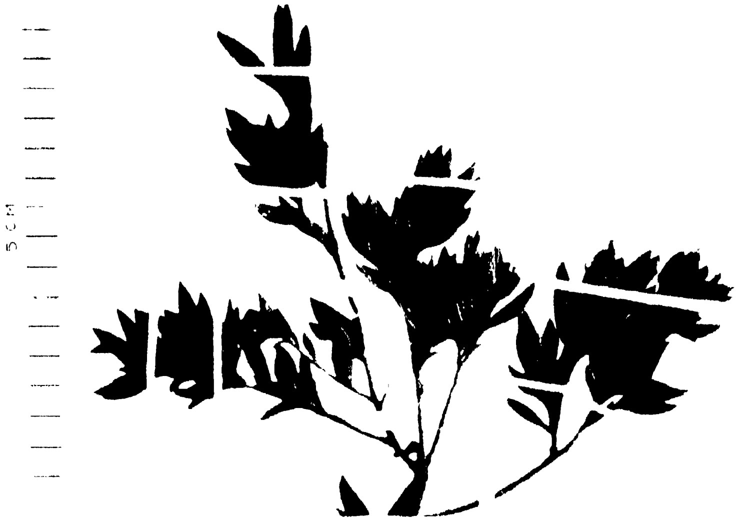


FIG. 1. DACRYDIUM FALCIFORME (PARL.) PILG.

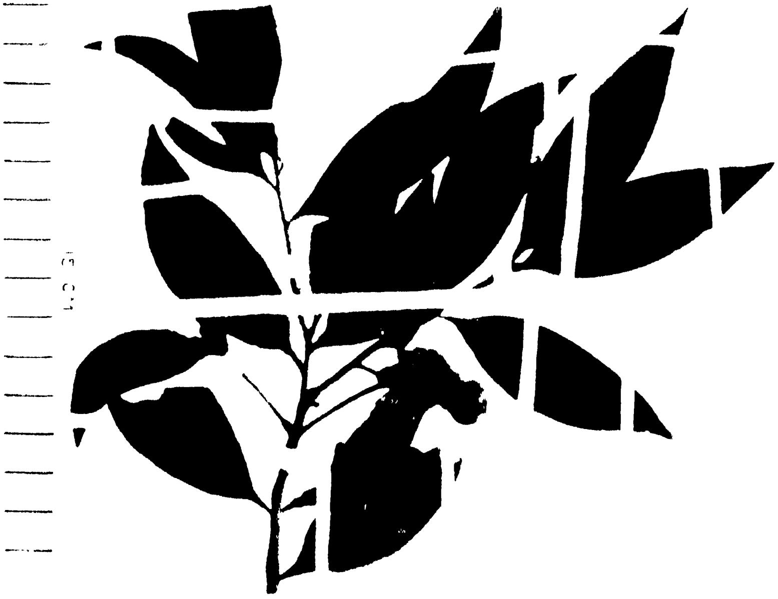


FIG. 2. PODOCARPUS BLUMEI ENDL.

PLATE XXVIII.

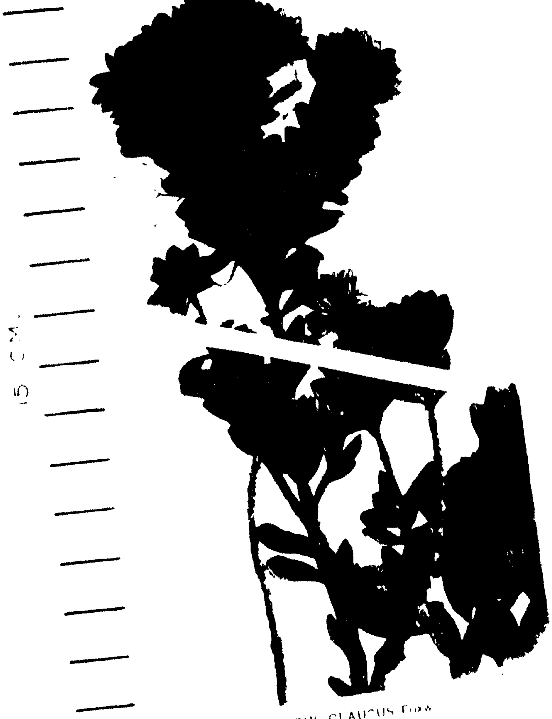


Fig. 1. PODOCARPUS GLAUCUS Foxw.

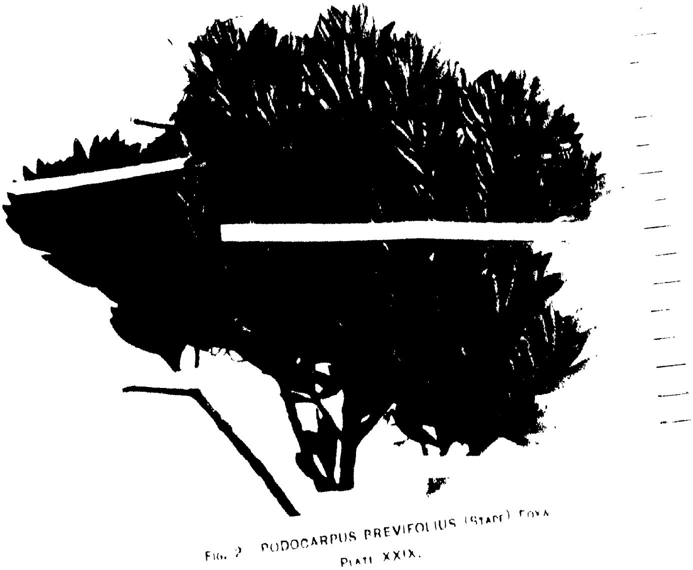


Fig. 2. PODOCARPUS BREVIFOLIUS (Stapf) Foxw.

Plate XXIX.

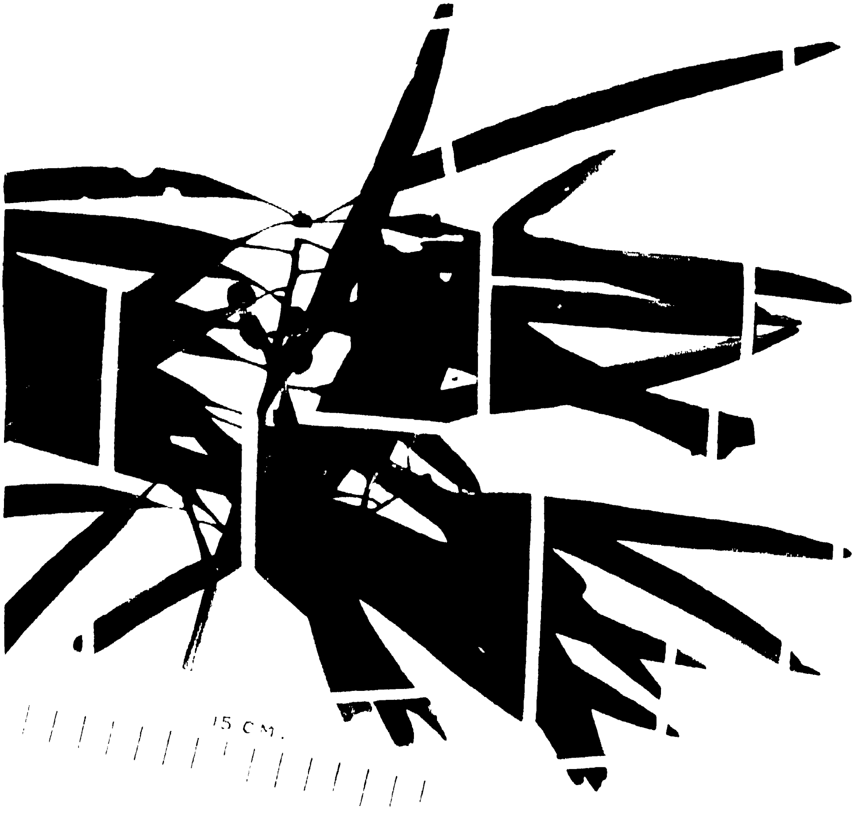
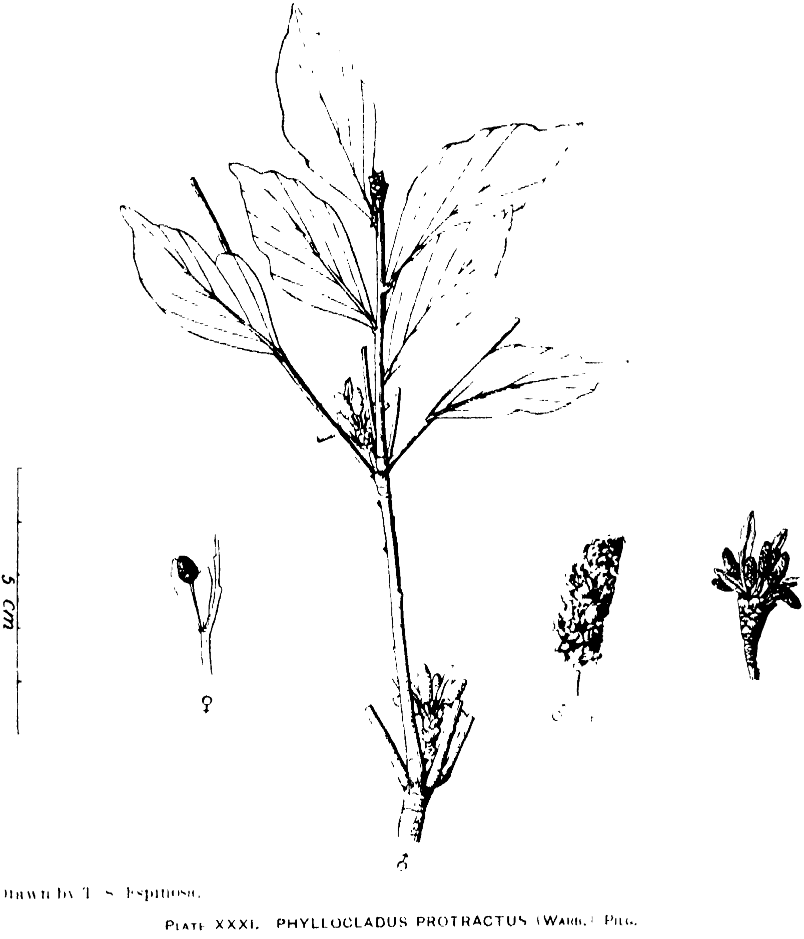


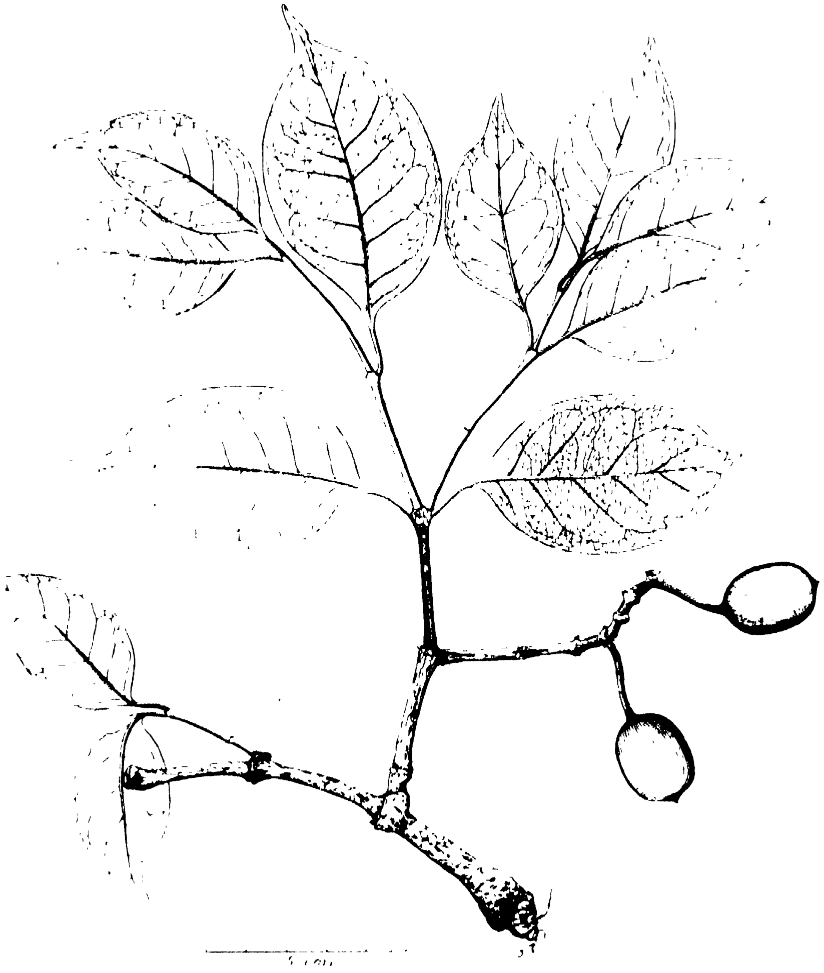
PLATE XXX. PODOCARPUS PHILIPPINENSIS Foxw.



Drawn by T. S. Espinosa.

Plate XXXI. PHYLLOCLADUS PROTRACTUS (Warb.) Pilg.

♀ For. Bur. 10957. ♂ For. Bur. 18364.



Drawn by T. S. Espinosa

PLATE XXXII. GNETUM ARBOREUM Foxw.

THE PHILIPPINE JOURNAL OF SCIENCE, C. BOTANY.
Vol. VI, No. 3, July, 1911.

BEDARU AND BILLIAN: TWO IMPORTANT BORNEO TIMBER TREES.

By FRED W. FOXWORTHY.

(From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.)

BEDARU.

Urandra corniculata (Becc.) comb. nov.

Platea corniculata Becc. in Malesia **1** (1877) 117.

This plant is variously known as *bedaru, bedaro, pedaro, daru* and *daroo.* It produces a wood which is very highly esteemed[1] and which is undoubtedly one of the best in Borneo. The wood is best known in Sarawak; but it is also to be found on the Singapore market and is said to come from Sumatra.

Flowering material, furnished by Mr. J. C. Moulton, Curator of the Sarawak Museum, was sent to Dr. Beccari for comparison. Dr. Beccari writes that this material represents the species described by him under the name of *Platea corniculata,* from rather incomplete material in the botanic gardens at Buitenzorg. It is apparent to me, from examining the material sent by Mr. Moulton, that the plant is a *Urandra.* It is therefore necessary to make the new combination *Urandra corniculata* (Becc.) Foxw. This plant is represented in the herbarium of the Bureau of Science by good flowering material collected by Mr. J. C. Moulton near Kuching in May 1909 and by *Foxworthy 104,* in bud, collected near Lundu, Sarawak, May 1908.

BILLIAN.

Eusideroxylon zwageri Teijsm. & Binn. in Natur. Tijdschr. Nederl. Indie **25** (1862) 292, *pl.;* Benth & Hook. f. Gen. Plant. **3^{1}** (1880) 155; Miquel, Sumatra, seine Pflanzenwelt (1862) 93; Van Eeden, Houtsoorten van Nederlandsche Oost-Indie, Bul. Kol. Mus. te Haarlem (1906) 205; Beccari, Nelle foreste di Borneo 581; Bargagli-Petrucci, in Malpighia (1902) 18; Foxworthy in Philip. Journ. Sci. **4** (1909) Bot. 452; Ridley in Agric. Bull. S. S. & F. M. S. **1** (1901) 247; Blits, De Anatomische Bouw der Oost Indische Ijzerhoutsoorten, Bul. Kol. Mus. te Haarlem **19:** 27.

Bihania borneensis Meissn. in DC. Prodr. **16^{1}** (1864) 96.

Eusideroxilon borneense Villar Noviss. App. (1880) 179. Villar reduced *Salgada lauriflora,* Blanco, Fl. Filip. ed. 2 (1845) 221 to this. He was mistaken in considering that species an *Eusideroxylon.* It is really a *Cryptocarya,* as Merrill has shown.[2]

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[1] Indo-Malayan Woods, *This Journal* **4** (1909) Bot. 492.

[2] Bur. Govt. Lab. Publ. (Philip.) **27** (1905) 73; Philip. Journ. Sci. **4** (1909) Bot. 254, *Cryptocarya lauriflora* (Blanco) Merr.

The true *billian* or Borneo ironwood was collected by me on the Island of Tawi Tawi recently (*Bur. Sci. 10833*, Jan. 19, 1910). It is there known by the name of *tambulian*, and is found in a strip of wet forest which shows very much the natural habitat of *billian* where it reaches its best development in Borneo. Also collected by W. Klemme, *For. Bur. 22522*, January, 1911. The wood has also been reported from one of the small islands just south of Mindanao, so it is probable that the species will be found to have a more extended range than is shown by the specimens cited.

One of the small islands of the Sulu group has the name of Tambulian, but is said to have none of this tree on it at the present time. The known range of the species is now Sumatra, Banka, Billiton, Borneo, the Philippines.

In Tawi Tawi, as elsewhere (T. & B. l. c. 290; Miquel l. c. 93; Beccari l. c. 566, 581; Foxworthy, l. c. 452), different varieties of this tree seem to be recognized. Two different sizes and shapes of leaves are found and two different sizes and shapes of fruit. One form of fruit is almost spherical and another is long ellipsoid. Whether these are merely chance variations or specific differences I do not know; but, from the fact that they seem to occur under the same natural conditions, the differently shaped fruits being found together on the ground under the same tree, I incline to the former view. However, this is a question which can only be settled by a more detailed study of living trees.

A very conspicuous feature of the tree habit, which I have not seen mentioned in descriptions of the tree, is that the young leaves have a beautiful coppery red color and are thin membranous in texture. This makes the tree recognizable at some little distance in the jungle. The bark is thin, gray and fissured, with fissures extending in a longitudinal direction.

THE PHILIPPINE JOURNAL OF SCIENCE, C. BOTANY.
Vol. VI, No. 3, July, 1911.

SAPINDACEAE NOVAE PHILIPPINARUM INSULAE POLILLO.

Auctore L. RADLKOFER.
(*Munich, Bavaria.*)

Allophylus leucocladus Radlk. sp. nov.

Arbuscula; rami teretes, cortice albissimo laevi; folia 3-foliolata, majuscula, petiolis sat longis robustis supra subsulcatis puberulis; foliola late elliptico-lanceolata, intermedia subobovata, omnia breviter obtuse acuminata, in petiolulos conspicuous attenuata, supra medium obsolete dentata, subcoriacea, nervis lateralibus remotiusculis procurvis in dentes excurrentibus, laxe subclathrato-venosa et subtiliter reticulata, fuscescentia, subtus pallide viridia, praeter axillas nervorum barbatas subglabra; thyrsi simplices, solitarii, folia superantes, puberuli, fere a basi dense attamen ± interrupte cincinnigeri; flores mediocres, glabri; fructus — (non suppetebant).

Rami 3 mm crassi. Folia petiolo 2.5–6.5 cm longo adjecto 13–23 cm longa; foliola cum petiolulis 0.6–1 cm longis 11–16 cm longa, 5–8 cm lata, lateralia minora. Thyrsus (unus tantum suppetebat) 21 cm longus. Alabastra diametro 1.5–2 mm. Sepala margine glanduloso-pilosa; petala cuneata; discus glaber; stamina inferne villosa.

Quodammodo accedit ad A. leptococcum R. et hoc mediante ad A. ternatum R.; ab utroque inter alia differt cortice albo, ab A. ternato insuper thyrso praelongo.

In Philippinarum insula Polillo, *Bur. Sci. 6880 Robinson*, (m. Aug. 1909 fl.; comm. ex Hb. Manil.)

Otophora oliviformis Radlk. sp. nov.

Arbor mediocris; folia ad trunci apicem congesta, magna, sessilia, ca. 7-juga, rhachi tereti striata praesertim superne setuloso-hirsuta; foliola opposita, late oblonga, vel inferiora elliptica, breviter obtusa acuminata, basi obtusa inaequaliter subcordata petiolulo perbrevi tumido setuloso insidentia, membranaceo-chartacea, nervis lateralibus procurvis subtus prominentibus, laxe reticulato-venosa, praeter nervi mediani basin parce setulosam glabra, supra livida, subtus pallidiora, praesertim supra nitida, epidermidis inferioris cellulis pachydermicis margine punctatis, utrinque glandulis cylindricis e cellulis 12–20 uniseriatis exstructis basi profunde immersis ornata, infima (stipuliformia) parva, sessilia, ovata; thyrsi e trunco enascentes, solitarii (?), sessiles, valde elongati, rhachi sat dense cincinnigera striata glabra fuscopurpurea; cincinni sessiles; fructus baccatus, oliviformis, incomplete 2-locularis, glaber, rubicundus (siccus cinnamomeus), longiuscule pedicellatus, stigmate sessili obsolete bilobo coronatus; semina —(immatura tantum suppetebant).

Arbor 10-metralis. Folia parte rhacheos petiolari 17 cm longa inclusa 60 cm longa, interjugis 6–8 cm longis; foliola cum petiolulis ad 6 mm longis 17–28 cm longa, ad 8.5 cm lata. Thyrsus (unus tantum suppetebat) 32 cm longus, pedicelli prope basin articulati 14 mm longi. Fructus 2 cm longus, 1.2 cm latus.

In Philippinarum insula Polillo, *Bur. Sci. 10330 McGregor*, (m. Oct.–Nov. 1909, fr.; comm. ex Hb. Manil.)

Dictyoneura rhomboidea Radlk. sp. nov.

Arbor (?); rami teretes, striati, fusci, superne fulvo-puberuli; folia abrupte pinnata, petiolo teretiusculo, rhachi puberula; foliola 10–12, subopposita, ex ovali manifeste rhomboidea, apice breviter obtuse acuminato obsolete paucidentata, basi valde inaequilatera (latere interiore latiore) petiolulis perbrevibus insidentia, membranacea, utrinque subtiliter reticulato-venosa, minutim pellucido-punctata, glandulis lepidoideis adspersa, praeter nervos supra pilosulos glabra; thyrsi axillares, eramosi, striati, puberuli; flores —(non suppetebant); fructus majores, obovoidei coccinei, extus glabri, granulati, intus praeter septum dense rufo-pilosi, loculicide bivalves, abortu 1-spermi; semen ovoideum, nigro-fuscum, nitidum, ventre usque ad medium arillo ochroleuco vestitum.

Rami 5 mm crassi. Folia petiolo 3–4 cm longo adjecto ca. 24 cm longa; foliola cum petiolulis 1.5 mm longis 7–9 cm longa, 2.5–3.5 cm lata. Thyrsi 9–15 cm longi; pedicelli basi articulati 3–4 mm longi. Fructus ca. 1.4 cm longus, 1–1.2 cm crassus.

In Philippinarum insula Polillo, *Bur. Sci. 10359 McGregor*, (m. Oct.–Nov. 1909, fr.; comm. ex Hb. Manil.)

Trigonachras cuspidata Radlk. sp. nov.

Arbor sat alta; rami, thyrsi petiolique glabriusculi; folia abrupte pinnata, petiolo rhachique teretiusculis; foliola 6, opposita vel subopposita, oblongo-lanceolata, inaequilatera, subfalcata, in acumen acutum cuspidiforme desinentia, in petiolulos longiusculos basi incrassatos attenuata, subcoriacea, nervis lateralibus subtilibus procurvis vel in latere angustiore obliquis supra prominulis, glabra, praesertim supra nitida, glandulis maculiformibus nullis, parcius pellucido-punctata, epidermide mucigera; thyrsi ad ramorum apices axillares, folia dimidia aequantes, pedunculo sat longo, rhachi praesertim superne sat dense cincinnigera, pedicellis fructigeris valde incrassatis rhachi duplo crassioribus; flores —(non suppetebant); capsula magna, trigono-clavata, apiculata, glabra, aurantiaca, intus tomento villoso alutaceo induta; semen oblongum, teretiusculum, testa coriaceo-crustacea spadicea laevi exarillata.

Arbor 10-metralis. Rami 5 mm crassi. Folia petiolo 5–6 cm longo adjecto ad 26 cm longa; foliola cum petiolulis 1–1.5 cm longis 12–18 cm longa, 3.5–5 cm lata. Thyrsi pedunculo ca. 4 cm longo incluso ad 15 cm longi; pedicelli fructigeri ca. 1 cm longi, 3–4 mm crassi. Capsula 4.5 cm longa, 2–2.5 cm lata. Semen 1.5 cm longum, 6 mm crassum.

In Philippinarum insula Polillo. *For. Bur. 1411 Haggcr*, Jul. 1904, fr.; comm. ex Hb. Manil.)

THE PHILIPPINE JOURNAL OF SCIENCE, C. BOTANY.
Vol. VI, No. 3, July, 1911.

BOTANICAL NOTES UPON THE ISLAND OF POLILLO.

By C. B. ROBINSON.

(From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.)

The Island of Polillo lies off the eastern coast of Luzon, its southern extremity being almost in the same latitude as Manila. Published estimates give it an area of 852 sq km, making it sixteenth in size of the islands of the Philippine Archipelago. Recent surveys have shown that the outline indicated upon older maps is inaccurate, and the corrected area will probably be somewhat larger than that given here. Its greatest length is about 56 km, roughly from northwest to southeast, it is widest near its northern end and narrowest near the middle.

The nearest point on the Island of Luzon is about 32 km distant, and depths of nearly 180 m have been recorded in the interval. A reef runs from the lower end of the bay in which the town of Polillo is situated for several miles toward the opposite coast near Infanta. The northern end of the island is fringed by coral reefs extending 5 to 7 km from the shore. To the east lie several much smaller islands, beyond which the Pacific attains a great depth, with no land nearer in this direction than the Mariannes. Luzon is more distant to the south than to the west, but the water is shallower and the gap somewhat bridged by islands. Polillo is therefore one of the most isolated of the larger islands of the Philippines.

Except for cultivated land, Polillo is nearly everywhere covered with virgin forest, waste land being of very slight extent. The population is now estimated at over 3,000, but there are only two places of any importance, the town of Polillo near the southern extremity of the western coast, and the barrio of Burdeos, some miles north of Polillo and on the opposite side of the island. Apart from these, settlement is more scattered than is usual in the Philippines, but confined to narrow strips along the coasts, the northern excepted, clearings rarely going in more than 1 km and never more than 3 km. The northern part is inhabited by Negritos, at least so-called, with no definite locations, and is practically unknown. The interior is hilly, but the elevations are never great, the summit of Mount Malulud, the highest point, being only 340 m above the sea. There are many ravines and small rivers.

Until recently, practically nothing was known about its flora. On Dr. Warburg's visit to the eastern coast of Luzon, he sent a collector to the Island, and the specimens obtained are in the Berlin herbarium. One species, *Ardisia pirifolia* Mez, has been described from this source. In 1904, Mr. E. Hagger, of the Forestry Bureau, collected a few species, one of which is the type of *Trigonachras cuspidata* Radlk., not subsequently obtained there or elsewhere. My stay upon Polillo began exactly with the month of August, 1909, and continued until the 24th of that month. Mr. R. C. McGregor, ornithologist of this Bureau, arrived about a week after my departure, and remained until November 19, making extensive botanical collections, except at the beginning of his stay. Our routes were much the same. Both made headquarters in the town of Polillo, and explored the vicinity in many directions, both crossed by the same trail to Burdeos, one thereafter working to the north and the other to the south of that place, neither visited the extreme north of the island.

The general result was disappointing. The total of the collection numbers is 878, to which will be added several epiphyllous lichens, the flowering plants alone number 631. Many additional species of flowering plants are represented by leaves bearing epiphyllous hepatics or lichens, but not otherwise, as they were not found in flower or fruit during our stay. These are not enumerated. Frequently, the same species was obtained by both collectors, but one of the most remarkable features of the exploration was that this did not occur more frequently. At the beginning of his stay, Mr. McGregor made few collections, through fear that he would merely duplicate the earlier work, and throughout passed by the commoner weeds for this reason. Then again, no two persons, passing over the same ground in a tropical forest, would make exactly identical collections. The real explanation is seasonal. August is the end of the dry season on Polillo, the time of change is somewhat variable, but occurred in the interval between the two periods. How great a difference these causes produced is shown by the following figures:

	Species collected—		
	In August only.	From September to November only.	In both periods.
Hepatics	9	16	4
Mosses	3	10	6
Pteridophytes	24	17	15
Spermatophytes	224	117	107
Total	260	160	132

To this should be added about 30 numbers of palms and orchids, which will show similar proportions between duplicated and single collections, with a small balance in favor of the later months. The mosses, 28 numbers, and the fungi probably contain little of interest. On the other hand, the lichens are expected to add materially to the list of Philippine species. In spite of the disparity in numbers, Mr. McGregor's collection was the more interesting of the two.

As practically all belong to the Bureau of Science series, they will be cited by number only, except in the case of new species. Mr. McGregor's numbers are from 10210 to 10574 and 10761 to 10783, mine are 6792, 6831 to 7000, 9001 to 9308, and 9592 to 9597.

The island is peculiarly rich in epiphyllous hepatics and lichens, the former much the more abundant in August, the latter forming a greater percentage later in the year. This feature had been noted by Mr. J. B. Leiberg, who had previously visited the island. They occur at all elevations, but are somewhat most abundant just within the outer fringe of vegetation along the coast. They are practically always confined to the upper surface of mature leaves, and in the humid atmosphere of Polillo seem to have no difficulty in reaching the fruiting stage within such a period as the length of the life of the leaf will permit. As yet, the determinations of the lichens have not been received, but the hepatics have yielded a high percentage of novelties.

On the other hand, but one genus of flowering plants was obtained which was not previously recorded from the Philippines, and it has since been found by two collectors on other islands. There are herein indicated as endemic to Polillo only 14 species of flowering plants, to which a very few may subsequently be added where the material is in the hands of specialists, or is insufficient for certain determination. None of the ferns are endemic, and with hardly an exception, they are of wide distribution. In the enumeration of the species, those that are known to be of general or wide distribution in the Philippines are merely listed. However, when the species has previously been collected on but few occasions, or when the collections, however numerous, seem to have been confined to definite regions, the range is given.

It is from these cases of more or less restricted distribution that the most notable results of the exploration have been obtained. Several such cases excited comment until it was found that with rare exceptions they seemed to follow along definite lines. These indications have been investigated with many species not collected on Polillo, and confirm the conclusions based on the species of that island, so that it is possible to offer a somewhat definite theory of distribution.

The plants of the Benguet-Lepanto mountain region have long been known to differ greatly from those of the less elevated provinces, and to find their allies on the higher mountains throughout the Archipelago, or without the Philippines altogether, often to the north. It now seems possible to divide the lower levels into two zones, roughly western Luzon and the rest of the Philippines.

For fear of misunderstanding, it may be stated at the outset that there are very many species that are found in both these regions, sometimes equally commonly in both, others more common in the one than in the other, and that these are not only weeds, and plants of the parang or jungle, but true forest species as well. It may further be postulated, that as the flora of the levels under discussion is undoubtedly Malayan, it is the northern extension which requires examination.

Now, so far as the present state of our knowledge permits statement, it is certainly the case that many species of the more southern islands of the Philippines extend up the east coast of Luzon, but not up the western; apparently a much smaller element extends up the western but not up the eastern; it has already been stated that a third extends up both.

Moreover, this division is at once geographic and ecologic, from the standpoint of the plants ecologic, but the ecology based on rainfall, and that in turn on the location of the principal mountain masses of Luzon. The west coast of Luzon has a prolonged dry season; on the east coast the rain is much more uniformly distributed, and the dry periods are of much shorter duration.

Luzon has also a southern coast and the evidence available indicates that it is for this purpose to be classed with the eastern. Moreover the mountain ranges are not continuous. Consequently the plants of the eastern coast are often also found in Laguna, on the slopes of Mount Maquiling and Banajao. North of Banajao and Banajao de Lucban, the divide between the Lake and the Pacific is less elevated, and its western slope is more nearly opposite the eastern slope of these mountains. We would therefore expect, and we do find, that many plants found on these two mountains also occur on the western slope of the Pacific divide, and in many cases extend also to the hilly country in the northeast of Rizal or even farther to the north. A still farther western extension is to the hills in the east of Bulacan, which has here been included in the western slope of Luzon, causing several of the exceptions hereinafter noted, these more nominal than real. Polillo is politically a part of the Province of Tayabas, but when Tayabas is named in the lists of distribution, the reference is to the mainland only: similarly, Rizal refers only to the hill district in the northeast of that province.

The further distribution of the more localized flowering plants of

Polillo almost defies tabulation, but the following summary will indicate its nature.

Endemic	14
Not endemic, but with no other Philippine locality	4
Tayabas only	14
Tayabas, and the Visayas, or Mindoro, or Mindanao	5
Tayabas, and two or more of preceding	8
Luzon, south of Tayabas, only	2
Luzon, south of Tayabas, and Mindanao	1
Tayabas, Luzon south of Tayabas, and more southern islands	9
Visayas only	8
Mindoro only	4
Mindanao only	8
Two or more of southern groups of islands	6
Palawan only	1
Luzon, south of Tayabas, Visayas, and Mindanao	2
Luzon south of Tayabas, Visayas, Mindanao, and Mindoro	1
Laguna and Rizal, each	1
Tayabas and Laguna or Rizal, or all three	5
Tayabas and Laguna or Rizal, or all, with further southward extension	8
Laguna or Rizal, not Tayabas, but farther south	12
Cagayan and Isabela, each	1
Batanes or Babuyanes to Luzon south of Tayabas	1
Batanes or Babuyanes to still farther south	4
Cagayan or Ilocos Norte to Luzon south of Tayabas	1
Cagayan or Ilocos Norte to Visayas	2
Cagayan or Ilocos Norte to still farther south	9
Benguet to Tayabas	1
Bontoc, or Benguet, or Nueva Vizcaya, or Nueva Ecija to Mindoro or farther south	6

None of these are yet known from western Luzon, and they comprise all the species whose distribution was sufficiently restricted to be considered worthy of mention, except 12. Two of the exceptions are known from Polillo and Bataan only, *Luisia foxworthii* Ames and *Dysoxylum altissimum* Merr.: in neither case is the identification quite certain. Of the remaining 10, locations are known on the western slope, and with one exception on other parts of the eastern besides Polillo. Four of these are widely distributed on the eastern slope, but on the western known only from eastern Bulacan, three of the four are dipterocarps, a group which has been very carefully investigated. Moreover, *Ardisia pirifolia* is at best very doubtfully distinct from a species of very wide Philippine distribution, and the collections identified as *Diospyros nitida* from Polillo, the only known east coast station, are not typical. *Ischaemum intermedium* and *Procris philippinensis* will probably prove to have a wide but local distribution, while *Astronia williamsii* and *Jasminum macrocarpum* appear to range across central Luzon.

Much of the apparent peculiarity in the distribution of the Polillo species is undoubtedly due to the paucity of collections from certain localities. Thus, it is to be expected that the 8 that are known from Polillo and Mindanao only, will all turn up in Samar, at present almost unknown botanically. Again, in the above summary, no reference is made to extra-Philippine distribution, and several species included, not yet collected in Mindanao, have a wide Malayan distribution.

In the following enumeration of species, the *Orchidaceae* have been identified by Mr. Oakes Ames, North Easton, Mass., the *Piperaceae* by M. C. de Candolle, Genève, Switzerland, the *Sapindaceae* by Prof. Dr. L. Radlkofer, München, Bavaria, the *Dipterocarpaceae* and *Rhizophoraceae* by Dr. F. W. Foxworthy, and the *Gramineae* by Mr. E. D. Merrill, who has also assisted me in various cases in different families.

HEPATICAE.

Determinations of the collections have been received from Dr. F. Stephani, but the list is not here given, as the new species and those known from previous collections but still undescribed form half of the total. They throw considerable light on the flora of the Islands as a whole, and are therefore summarized in contrast to those obtained on the opposite coast of Infanta in a very much shorter space of time. However, the bulk of the Infanta collections came from the summit or at least from mossy forest on Mount Binuang. Were only those of low levels to be contrasted, Polillo would make much the better comparative showing.

	Infanta.	Polillo.	Common to both.	Total.
New species	7	8	1	14
New to the Philippines	14	17	3	28
Previously known from the Philippines	8	3	2	9
Total	29	28	6	51

Binuang is the most northern mountain on the east coast from which collections have been obtained. Collections in such groups have been too scattered and made in too haphazard a fashion to warrant any sharp conclusions, but it may fairly be claimed that the hepatics of the east coast likely to catch the eye of one not especially interested in them, must differ considerably from those of either the mountain region of northern Luzon or of the more frequently visited mountains such as Mariveles and Banajao. The figures are open to the qualifications that there may be in European herbaria material collected by Semper, Micholitz, or others, concerning which no information is available here, that two of the species counted from Infanta as new to the Philippines have since been obtained, one on Canlaon Volcano, in Negros, the other on Mount Banajao, and that one indeterminable number from Polillo is omitted.

The Polillo genera are *Archilejeunea*, *Cololejeunea*, *Eulejeunea*, *Frullania*, *Hygrolejeunea*, *Leptolejeunea*, *Lophocolea*, *Mastigobryum*, *Mastigolejeunea*, *Plagiochila*, *Pycnolejeunea*, *Radula*, and *Thysananthus*, all previously known from the Philippines. Infanta adds *Saccogyna* to the Philippine list, its other genera being *Ceratolejeunea, Chiloscyphus, Cololejeunea, Diplasiolejeunea, Drepanolejeunea, Frullania, Lepidozia, Leptolejeunea, Mastigobryum, Metzgeria, Plagiochila, Pycnolejeunea, Radula, Schistochila,* and *Thysananthus.*

MUSCI.

The identifications of the mosses, received from Dr. V. F. Brotherus, show as expected less interesting results than the hepatics, but also add to the number of species known from the Philippines. The comparison with Infanta is again worthy of notice, as it and Polillo have each added two new species to botanical knowledge, one of those from Infanta having a wider distribution, while from Infanta have come four, and from Polillo five species not hitherto known to occur in the Philippines. The Polillo list is as follows. *Aerobryopsis lanosa* (Mitt.) Broth., *10514: Calymperes orientale* Mitt., *9281, 10505*, hitherto known from Labuan: *Chaetomitrium orthorrhynchum* (Doz. & Molk.) Bryol. Jav., *6883* in part, *10504, 10511*, not previously recorded from the Philippines but found in Sumatra, Java, Borneo, and Celebes; *C. warburgii* Broth., *10513: Fissidens nobilis* Griff., *10516: Himanthocladium loriforme* (Br. Jav.) Fleisch., *6948, 10507: Hypnodendron arborescens* (Mitt.) Lindl., *10515*, not previously reported from the Philippines, the only species collected both in Polillo and Infanta, known also from Ceylon, Sumatra, Java, and Celebes: *Leucobryum sanctum* Hpe., *10508: Leucophanes albescens* C. M., *9066: Meiothecium jagori* (C. M.) Broth., *9076*, the genus then new to the Philippines, the species reported from Ceylon, Malacca, Java, Amboina, and Celebes: *Neckeropsis gracilenta* (Br. Jav.), *10510: Pelekium velatum* Mitt., *6852, 10506: Plagiothecium miquelii* (Br. Jav.) Broth., *10512, 10520: Rhizogonium spiniforme* (Linn.) Bruch, *9096, 10518: Taxithelium* sp. nov., *6885* in part; *T.* sp. nov., *10509; T. instratum* (Brid.) Broth., *10521* in part: *Trismegistia lancifolia* (Harv.) Broth., *9107, 9200, 10517, 10519: Vesicularia reticulata* (Doz. & Molk.) Broth., *10521* in part, not previously recorded from the Philippines, but known from Nepal, Sikkim, Khasia, Sumatra, Java, Celebes, and New Caledonia.

PTERIDOPHYTA.

(Determined by Dr. E. B. Copeland.)

HYMENOPHYLLACEAE.

Trichomanes grande Copel., *10289; T. christii* Copel., *10290; T. cumingii* (Presl) C. Chr., *6928, 10299; T. cupressoides* Desv., *9190; T. javanicum* Blume, *10298; T. maximum* Blume, *6849; T. pallidum* Blume, *10318; T. treubii* Racib., *9204.*

CYATHEACEAE.

Cyathea integra J. Sm., *6851.*

POLYPODIACEAE.

Acrostichum aureum Linn., *9058, 10309: Antrophyum reticulatum* (Forst.) Kaulf., *10291: Asplenium laserpitiifolium* Lam. var., *9189; A. nidus* Linn., *9142, 10312; A. nitidum* Sw., *6855; A. tenerum* Forst., *6858: Cyclopeltis presliana* (J. Sm.) Berk., *9234: Cyclophorus acrostichoides* (Forst.) Presl, *10311; C. adnascens* (Sw.) Desv., *10302, 10313; C. nummularifolius* (Sw.) C. Chr., *10310: Davallia denticulata* (Burm.) Mett., *9059, 10296: Drynaria quercifolia* (Linn.) J. Sm., *9243, 10304: Dryopteris canescens* (Blume) C. Chr. var., *7000; D. dissecta*

(Forst.) O. Ktze., *9201; D. luzonica* Christ, *6941: Humata heterophylla* (Sm.) Desv., *9248, 9290, 10314: Lindsaya decomposita* Willd., *9103; L. gracilis* Blume, *9092; L. pectinata* Blume, *9102, 9188: Nephrolepis hirsutula* (Forst.) Presl, *9071; N. laurifolia* Christ, *s. n.: Oleandra colubrina membranacea* Copel., *10316: Polypodium phymatodes* Linn., *9019: P. punctatum* (Linn.) Sw., *9023, 10307; P. selliguea* Mett., *10288; P. sinuosum* Wall., *9078, 10306: Pteris longifolia* Linn., *9168; P. tripartita* Sw., *9307: Stenochlaena palustris* (Burm.) Bedd., *10294, 10295: Taenitis blechnoides* (Willd.) Sw., *10315: Tapeinidium pinnatum* (Cav.) C. Chr., *9202, 9203, 10305: Tectaria decurrens* Copel., *6945, 10301; T. irregularis* (Presl) Copel., *9235; T. irregularis macrodon* Copel., *6908: Vittaria elongata* Sw., *10297; V. lineata* (Linn.) Sm., *9143; V. scolopendrina* (Bory) Thw., *9118, 10317.*

PARKERIACEAE.

Ceratopteris thalictroides (Linn.) Brongn., *9160.*

SCHIZAEACEAE.

Lygodium circinnatum (Burm.) Sw., *10303; L. flexuosum* (Linn.) Sw., *6901, 9053; L. scandens* (Linn.) Sw., *10287.*

MARATTIACEAE.

Angiopteris angustifolia Presl, *6927.*

LYCOPODIACEAE.

Lycopodium cernuum Linn., *9094, 10286; L. filiforme* Roxb., *10292; L. phyllanthum* H. & A., *9239; L.* sp., *9252, 10780.*

PSILOTACEAE.

Psilotum nudum (Linn.) Griseb., *10308.*

SELAGINELLACEAE.

Selaginella, probably 2 species, *6907, 6911, 10293, 10300.*

SPERMATOPHYTA.

CYCADACEAE.

Cycas circinalis Linn., *10776.*

TAXACEAE.

Podocarpus neriifolius Don, *10779.*

PINACEAE.

Agathis alba (Lam.) Foxw. in Philip. Journ. Sci. 5 (1910) A 173.

This tree is said by well informed natives of Polillo to be found along the Anibauan River, in the northeast of the island. The report is likely correct, and the elevation must be unusually low for the species, as compared with other parts of the Philippines.

GNETACEAE.

Gnetum latifolium Blume, *10341.*

PANDANACEAE.

Pandanus botryoides Martelli in Philip. Journ. Sci. 3 (1908) Bot. 66.
Previously known only from northeastern Mindanao, *10473.*

Pandanus clementis Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 178.
Previously known only from Mindanao, *10479.*

Pandanus utilissimus Elmer Leafl. Philip. Bot. 1 (1906) 86.
Seen by Mr. McGregor, but not collected. Otherwise known from Laguna and Tayabas.

Freycinetia luzonensis Presl Epimel. Bot. (1851) 238.
A sterile specimen, *10476,* is on vegetative characters, the best match for the type of this species that has yet been collected. As some discussion has been caused by a previous note[1] of mine, I wish to clear up that side of the matter. When that was written, the material at the New York Botanical Garden consisted of several recent collections, chiefly from Bataan, and a sheet of *Cuming 1455,* the type number of *F. luzonensis,* sent to me for identification by Prof. Wm. Trelease of the Missouri Botanical Garden. I decided correctly that the Bataan collections were not *F. luzonensis* Presl, but fell into the error of believing that they would fall under that species as interpreted by Warburg in the Pflanzenreich. I did not take up *F. cumingiana* Gaudich. because of alleged priority, for I consider that the absence of description invalidates its claims. But I did think that *F. cumingiana* represented the Bataan plants and therefore my conception of *F. luzonensis* Warb.; so I attempted to publish it not for Presl's species, but by referring to it Warburg's description. There is no doubt at all that Warburg correctly interpreted Presl. Nomenclaturally, therefore, my error has in no way altered the status of either name, but the plants then referred to *F. cumingiana* were, with one exception, *F. robinsonii* Merr. *F. luzonensis* is only known from the Province of Camarines and Polillo.

Freycinetia monocephala Elmer Leafl. Philip. Bot. 1 (1907) 218.
Otherwise known only from Rizal and Tayabas, *10477.*

Freycinetia montalbanica Martelli in Webbia 3 (1910) 18.
From description and comparison with photographs of the type, it seems best to identify with this *9209, 10475,* and *10478.* The only conspicuous difference is in the internodes, which in the Polillo plants are about 15 mm long. The plants were erect-scandent with falcately spreading branches, the leaves range in length from 18 to 40 cm, the largest syncarps are 4 cm long and 2.5 cm in diameter. *For. Bur. 22192 Alvarez,* northeastern Nueva Ecija, is identical with the Polillo collections. Almost certainly, other material from Camarines Province is referable here. The type of the species is from Rizal Province.

Freycinetia warburgii Elmer Leafl. Philip. Bot. 1 (1907) 218.
Otherwise known from Laguna and Tayabas, *9001.*

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[1] Bull. Torrey Bot. Club 35 (1908) 64.

Freycinetia sp.

What seems to be an undescribed species is represented by *10476 a*, but as it is sterile, and the collections most nearly matching it are staminate, it is left unnamed.

Other species: *Pandanus copelandii* Merr., *6892, 10472; P. coronatus* Martelli, *6949;* both abundant, the latter doubtfully distinct from *P. tectorius* Sol.: *Freycinetia multiflora* Merr., *10474.*

GRAMINEAE.

(*Bambuseae* determined by Mr. J. S. Gamble, other species by Mr. E. D. Merrill.)

Dendrocalamus curranii Gamble in Philip. Journ. Sci. **5** (1910) Bot. 271.

Probably represented by *10417;* otherwise known only from Tayabas.

Dinochloa scandens (Blume) O. Ktze. Rev. Gen. Pl. (1891) 773.

Otherwise known in the Philippines from Mindoro, Palawan, Balabac, Mindanao, and Basilan: *10416*, probably also *10415;* a variety in Laguna, Bataan, Mindoro, Mindanao, and Basilan.

Gigantochloa atter Kurz ex Munro in Trans. Linn. Soc. **26** (1868) 125.

Probably represented by *10414;* the species is Malayan and not otherwise known from the Philippines.

Ischaemum intermedium Brongn. in Duperr. Voy. Coq. Bot. (1829) 73.

Otherwise known in the Philippines from Manila and Samar; *10419, 10425.*

Leptaspis urceolata (Roxb.) R. Br. in Benn. Pl. Jav. Rar. (1838) 23.

Otherwise known in the Philippines from Mindanao and Samar; *6864, 10418.*

Lophatherum gracile Brongn. loc. cit. 50, *pl. 8.*

Other Philippine distribution Nueva Ecija, Mindoro, Mindanao; *9093, 10423.*

Other species: *Centotheca latifolia* (Linn.) Trin., *6906, 10427: Coix lacryma-jobi* Linn., *9286: Dactyloctenium aegyptiacum* (Linn.) Willd., *6978: Digitaria consanguinea* Gaudich., *9225: Eleusine indica* Gaertn., *9171: Imperata cylindrica koenigii* Benth., *9158: Ischaemum muticum* Linn., *9134; I. rugosum distachyum* (Cav.) Merr., *9043: Isachne miliacea* Roth, *6910, 10421: Miscanthus japonicus* Andr., *9298: Panicum auritum* Presl, *9225a; P. colonum* Linn., *9157; P. crus-galli* Linn., *10424; P. indicum* Linn., *s. n.; P. stagninum* Retz., *9046: Paspalum conjugatum* Berg., *9294, 10426: P. longifolium* Roxb., *9017; P. scrobiculatum* Linn., *9044, 10420: Saccharum spontaneum* Linn., *9159: Setaria flava* Kunth, *6925, 10422.*

CYPERACEAE.

Fimbristylis utilis Elmer Leafl. Philip. Bot. **3** (1910) 855.

Represented by *10245.* The species probably also occurs in southeastern Luzon, and in the Visayas is of considerable economic importance; it is also found in Mindanao.

Mapania humilis (Hassk.) F.-Vill. Noviss. App. (1883) 309.

Other Philippine distribution, Rizal, Laguna, Mindoro, Mindanao; *10247.*

Mapania kurzii C. B. Clarke in Hook. f. Fl. Br. Ind. **6** (1894) 681; Merr. in Philip. Journ. Bot. **2** (1907) Bot. 422.

A Polillo specimen, *10248*, is a very good match for *Merrill 4001*, Atimonan, Tayabas, about 65 km south of Polillo, determined as *M. kurzii* with some doubt by the late C. B. Clarke. It does not agree exactly with the description of that species, but is nearer to it than to any other. Its other Philippine distribution is Negros and other localities in Tayabas.

Scirpodendron costatum Kurz in Journ. As. Soc. Bengal 38^2 (1869) 85.

Represented by *10249*, but by only one other Philippine collection, *Merrill 5257*, from Palawan; widely distributed from Ceylon to Australia and Samoa.

Remirea maritima Aubl. Pl. Guian. 1 (1775) 45, *pl. 16*.

Represented by *9133*, but otherwise by very few Philippine collections, from Mindanao, Mindoro, Camarines, and Cagayan; tropics of the world.

Other species: *Cyperus diffusus* Vahl, *6909; C. haspan* Linn., *9030; C. pilosus* Vahl, *9034*, *10251: Eleocharis retroflexus* (Poir.) Urban, *9029: Fimbristylis diphylla* Vahl, *9033a*, *10246; F. miliacea* Vahl, *9033: Fuirena glomerata* Lam., *9028; F. umbellata* Rottb., *9027: Hypolytrum latifolium* L. C. Rich., *10255: Kyllinga monocephala* Rottb., *9173: Pycreus odoratus* (Linn.) Urban, *10244: Scirpus erectus* Poir., *9045*, *10252*, *10253; S. grossus* Linn. f., *9026*, *10254; S. mucronatus* Linn., *10250: Scleria purpureovaginata* Boeck., *6897*, *10256: Torulinium confertum* Desv., *6909*.

PALMACEAE.

We were rather unusually successful in obtaining fertile material of palms, 20 collections in all, which are in the hands of Dr. O. Beccari for identification. The genera represented are *Areca*, *Arenga*, *Calamus*, *Korthalsia*, *Livistona*, *Nypa*, *Pinanga*, and *Oncosperma; Cocos nucifera* Linn., the commonest species of all, was not collected.

ARACEAE.

Spathiphyllum commutatum Schott in Oestr. Bot. Wochens. 7 (1857) 158.

Other Philippine distribution Mindanao, Mindoro, Albay; *10401*.

Raphidophora sp.

An apparently undescribed species is represented by *9181*. It is noteworthy from the presence of stinging hairs on the peduncle and is well known on the island for this reason. The stinging effect is moderately severe, and lasts for about a day.

Other species: *Aglaeonema marantifolium* Blume, *6843: Alocasia macrorrhiza* (Linn.) Schott, *6997; A. heterophylla* (Presl) Merr., *9199*, *10772: Amorphophallus campanulatus* Blume, *9208: Homalomena rubescens philippinensis* Engler, *6933: Raphidophora merrillii* Engler & Krause, *10370*.

FLAGELLARIACEAE.

Flagellaria indica Linn. was common and known under its usual Tagalog name of *balinguay*, but as the only fertile specimen seen by either collector, *9065*, had only a few old fruits, the flowering season is probably July or earlier.

ERIOCAULACEAE.

Eriocaulon merrillii Ruhl. in Perk. Fragm. Fl. Philip. (1904) 136.

Polillo specimens, *9031*, examined side by side with those of cotypes of *E. merrillii* in this herbarium are in almost exact agreement, but in both cases the sepals of the pistillate flowers are two in number and not wanting as was stated in the original description. The species still seems distinct in spite of this change. It is a plant of very low elevations both in Culion and in Polillo, in the latter in rice-paddies, and seems to have a wide Philippine distribution.

COMMELINACEAE.

Four species were collected, all of wide Philippine distribution: *Commelina nudiflora* Linn., *9215*: *Cyanotis capitata* (Blume) C. B. Clarke, *6904*: *Forrestia philippinensis* Merr., *6935*, *10387*: *Pollia sumatrana* Hassk., *9275*.

PONTEDERIACEAE.

Represented by the common *Monochoria vaginalis* Presl, local name *calabua*; *9022*, *10338*.

LILIACEAE.

Dracaena sp.

This seems to be the species figured by Sarassin[2] under the name of *D. multiflora* Warb., to which I can find no other reference, and so believe to be still undescribed. The Celebes plants, found in different localities there, grew in similar situations to those of Polillo, arid coral-rocks; the habit is very much the same, except that the Celebes trees were larger and more widely branched than those of Polillo, but they were no larger than those from which *Merrill 5402*, Ubian Island (Sulu Archipelago), was obtained. The latter can only be distinguished from the Polillo collection, *10407*, by its slightly narrower leaves; not even this avails to separate *Bur. Sci. 10635 McGregor*, sterile, from Dalupiri, one of the Babuyanes Islands. *D. maingayi* Hook. f. is very closely allied, but its fruits are much larger.

Other species: *Dracaena angustifolia* Roxb., *6980*, *10364*: *Dianella caerulea* Sims, *9206*, *10394*.

AMARYLLIDACEAE.

Curculigo glabra Merr. in Philip. Journ. Sci. **2** (1907) Bot. 297.

Otherwise known from Mindoro; *10366*.

Other species: *Crinum asiaticum* Linn., *9091*, fairly frequent along the coast, local name *bacón*: *C. zeylanicum* Linn., *10331*, cultivated in gardens.

DIOSCOREACEAE.

There are 3 collections of *Dioscorea*, *6971* in fruit, *9068* and *10403* with staminate flowers; vegetatively all three might be the same, but the inflorescence of the staminate numbers is quite different, *9068* having fascicled axillary spikes, while in *10403* the fascicles are numerous, separated by about 2 cm on an axillary peduncle. Both belong to the group with entire leaves and 6 fertile anthers. The fruiting specimen, belonging to the section *Eudioscorea*, is probably the same species as *9068*.

IRIDACEAE.

Belamcanda chinensis (Linn.) DC. grows in waste places in the town of Polillo; it has doubtedless been introduced but is as well established as almost any weed in the place; *9050*.

MUSACEAE.

No collections were made. *Musa paradisiaca* Linn. and *M. textilis* Née are both cultivated.

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[2] Reisen in Celebes **1** (1905) 136, *pl. 4*.

ZINGIBERACEAE.

Alpinia flabellata major Ridley in Philip. Journ. Sci. 4 (1909) Bot. 188.
Represented by *6883;* other Philippine distribution Batanes and Babuyanes Islands, Rizal, Mindoro, and Mindanao.

Alpinia rufa (Presl) K. Schum. in Engl. Bot. Jahrb. 27 (1899) 293.
Known also from Laguna and Tayabas, and from Negros and Bucas (northeast of Mindanao); *9207, 10241.*

Globba leucocarpa Ridley in Philip. Journ. Sci. 4 (1909) Bot. 161.
Otherwise known from Benguet, Leyte, and Mindoro; *6946, 10242.*

Plagiostachys philippinensis Ridley in Elmer Leafl. Philip. Bot. 2 (1909) 572.
Otherwise known from Laguna and Tayabas, Mindoro, and Mindanao; *6840.*

Zingiber spp.
Besides *Z. zerumbet* (Linn.) Smith, *6915,* local name *lancauas,* two other species were collected, probably new, but in both cases the material is too mature for description. One of these, represented by *10240,* is allied to *Z. mollis* Ridley, the other by *9198, 10237,* and probably *10238,* with the inflorescence on separate scapes, is not very closely allied either to *Z. zerumbet* or to *Z. pubisquama* Ridley, the two known Philippine species of the group, also differing from the two indicated by Ridley[3] by number alone.

Other species: *Costus speciosus* Sm., *6921, 6926, 10243: Kolowratia elegans* Presl, *10239.*

CANNACEAE.

Canna indica Linn., *9009; C.* sp., *9223;* both growing as escapes from cultivation.

MARANTACEAE.

Phrynium philippinense Ridley in Elmer Leafl. Philip. Bot. 2 (1909) 570.
Represented by *6866;* Babuyanes Islands, Nueva Vizcaya, Tayabas, Albay, Leyte, Negros, Mindoro, Mindanao.

Other species: *Donax cannaeformis* (Forst.) Rolfe, *6865, 10236,* local name *bamban: Phacelophrynium interruptum* K. Schum., *9219.*

ORCHIDACEAE.

(Determined by Mr. Oakes Ames.)

Bulbophyllum (Cirrhopetalum) makoyanum Reichb. f. in Gard. Chron. **1879**^{1}: 234; Ames in Philip. Journ. Sci. 6 (1911) Bot. 55.
Also known in the Philippines from Mindanao; *10438.*

Coelogyne

Ceatichis vestita (Reich. f.) Ames Orchidaceae 2 (1908) 139.
Represented by *10454;* other distribution Benguet, Rizal, Albay, Mindoro, Mindanao, Assam.

Cleisostoma kunstleri Hook. f. Icon. Pl. IV 4 (1894) *pl. 2335;* Ames in Philip. Journ. Sci. 6 (1911) Bot. 54.
Not otherwise known from the Philippines; *10444;* type locality Perak.

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[3] This Journal 4 (1909) Bot. 170.

Cryptostylis arachnites Blume Orch. Ind. Archip. (1858) 133.

Represented by *9097;* other Philippine distribution Laguna (?), Tayabas, Mindoro.

Cystorchis javanica (Blume) Blume Orch. Archip. Ind. (1858) 87; Ames in Philip. Journ. Sci. 6 (1911) Bot. 39.

Not otherwise known from the Philippines; *9282;* Malay Peninsula.

Dendrobium hymenanthum Reichb. f. in Bonplandia 3 (1855) 222.

Otherwise definitely known only from Rizal, but the exact localities of Cuming's orchids are unknown; *10453*, *5647* (flowering in Manila, plants from Polillo).

Luisia foxworthii Ames Orchidaceae 2 (1908) 222.

Type locality Bataan; *9257* appears to be this species, but the material is not satisfactory.

Malaxis dentata (Ames) Ames Orchidaceae 2 (1908) 125, *fig.*

Otherwise known from Mindoro; *10439.*

Malaxis macgregorii Ames in Philip. Journ. Sci. 6 (1911) Bot. 45.

Endemic in Polillo; *10440.*

Oberonia anceps Lindl. Sert. Orchid. (1838) sub *pl. 8 B.*

Represented by *10448;* other Philippine distribution Tayabas and Culion.

Oberonia thisbe Reichb. f. in Bonplandia 3 (1855) 223.

Represented by *9255;* otherwise definitely known from Guimaras.

Plocoglottis copelandii Ames in Philip. Journ. Sci. 2 (1907) Bot. 326.

Represented by *6863*, *10450;* other distribution Laguna, Negros, and Mindoro.

Podochilus xytriophorus (Reichb. f.) Schltr. in Mém. Herb. Boiss. 21 (1900) 47.

Represented by *6848;* other distribution Laguna, Mindoro, Mindanao, Borneo, Malay Peninsula.

Thelasis elongata Blume Mus. Bot. Lugd.-Bat. 2 (1856) 187.

Represented by *9245;* other distribution Camarines, Mindanao, Cagayan Sulu, Java.

Thrixspermum pallidum (Blume) Reichb. f. Xenia Orchid. 2 (1867) 122.

Represented by *10441;* other distribution Rizal, Mindanao, Basilan, Celebes, Amboina, Java, Malay Peninsula.

Other species: *Cymbidium finlaysonianum* Lindl., *10460: Dendrobium atropurpureum* (Blume) Miq., *9086*, *10458; D. crumenatum* Sw., *10459; D. indivisum* (Blume) Miq., *9253*, *10443*, *10455: Geodorum nutans* (Presl) Ames, *10445: Phalaenopsis luddemanniana* Reichb. f., *10437: Pholidota imbricata* Lindl., *10768: Podochilus micranthus* (Lindl.) Schltr., *9087*, *10446: Thrixspermum* sp., *10769: Trichoglottis* sp., *10451.* Nine collections remain to be determined.

CASUARINACEAE.

Represented by the common *Casuarina equisetifolia* Forst., *6986*, *10357*, local name *aguhó.*

PIPERACEAE.

Piper chaba Blume Verh. Bat. Genoots. 11 (1826) 168, *fig.* 7*:* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 432.

Represented by *9128, 10234;* other Philippine distribution, varieties included, Rizal, Albay, Mindanao.

Piper negrosense C. DC. in Elmer Leafl. Philip. Bot. 3 (1910) 786; Philip. Journ. Sci. 5 (1910) Bot. 454.

Represented by *9213;* otherwise known only from Negros.

Piper pilipes C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 423.

Represented by *6914;* otherwise known only from Mindanao.

Piper villilimbum C. DC. in Elmer Leafl. Philip. Bot. 3 (1910) 784; Philip. Journ. Sci. 5 (1910) Bot. 461.

Represented by *6853;* otherwise known from Tayabas, Mindoro, and Mindanao.

Other species: *Piper corylistachyon* C. DC. *6918, 6966, 10235: Peperomia* was searched for in vain.

CHLORANTHACEAE.

Chloranthus brachystachys Blume, *9192, 10327.*

FAGACEAE.

Quercus soleriana Vidal Revis. Pl. Vasc. Filip. (1886) 167.

Probably only one species is represented by *10319, 10325, 10402, 10412,* the second in flower, the others with fruit. The last is the most typical, *10402* has the tips of the bracts pointed and projecting slightly, *10319* is intermediate in this character.

MORACEAE.

Artocarpus integrifolia Linn. f., *9035,* local name *nanoa: Conocephalus violaceus* (Blanco) Merr., *9132, 10225* (staminate), *9021, 10226* (pistillate), local name *hanopol: Ficus ampelas* Burm., *9120, 9221,* local name *upling gubat; F. benjamina* Linn., *9251; F. caudatifolia* Warb., *6895, 10227,* local names *upling gubat, balete; F. clusoides* Miq., *9250; F. fiskei* Elmer, *6229; F. indica* Linn., *10231; F. megacarpa* Merr., *9229, 10229; F. minahassae* Miq., *6932,* local name *ayimit; F. nota* (Blanco) Merr., *6896, 10228,* local name *tibig; F. rubrovenia* Merr., *9124, 9276; F. ruficaulis* Merr., *10230; F. sinuosa* Miq., *9047,* not typical, local name *upling gubat.* None of these is of restricted distribution.

URTICACEAE.

Elatostema philippinense Elmer Leafl. Philip. Bot. 3 (1910) 888; C. B. Rob. in Philip. Journ. Sci. 5 (1911) Bot. 524.

Represented by *6841;* otherwise known from Negros and Mindanao.

Elatostema sp.

Material was collected of a sterile species, *9195,* as it was entirely different from anything previously seen. From leaves alone, it approaches *E. pinnatinervium* Elmer, but is quite distinct.

Elatostematoides manillense (Wedd.) C. B. Rob. in Philip. Journ. Sci. 6 (1911) Bot. 50.

The leaves of *6942* and *6943* are smaller than those of the cotype of the species in this herbarium, but are otherwise very similar. The numbers were collected separately at slightly different elevations a short distance apart, as one was much more herbaceous than the other, but this is not evident in dried material.

Procris philippinensis C. B. Rob. in Philip. Journ. Sci. 6 (1911) Bot. 505.

Represented by *9246*, epiphytic at sea-level; otherwise known from Bataan.

Procris (?) sp.

Excellent staminate material was obtained, *10335*, well matched by similar collections from Samar and Mindanao. From habit it is most likely to be a *Procris*, but it might well be a *Pellionia*, and it is not close to any species of either genus represented in this herbarium. It was deliberately omitted from my recent enumeration of the species of the family; it is barely possible that it does not belong there.

Other species: *Fleurya interrupta* (Linn.) Gaudich., *6905*: *Leucosyke capitellata* (Poir.) Wedd., *6894*, *10391*: *Pilea microphylla* (Linn.) Liebm., *9072*: *Pouzolzia zeylanica* (Linn.) Benn., *6902*, *6970*.

LORANTHACEAE.

Ginalloa lanceolata sp. nov.

Epiphytica, glabra: inflorescentiis axillaribus, fasciculatis, multinodiis, fructibus ovoideis: foliis petiolatis, lanceolatis, basi acutis, apice longiuscule acuminatis, trinerviis.

Similar to *G. cumingiana* (Presl) F.-Vill., but distinguished by its more truly lanceolate leaves, of thinner texture, 4 to 6.5 cm long, 12 to 20 mm wide, broader especially at the base, much more definitely acuminate: the inflorescences are 2.5 to 9 cm long, and their internodes 4 to 6 mm long in the middle of the inflorescence, averaging longer than those of *G. cumingiana*, while the bracts are only half the length of those of that species.

POLILLO, *Bur. Sci. 10429 McGregor*, in fruit, September 25, 1909. The original locality of Presl's species is not known, but it is now perfectly matched by *Bur. Sci. 7829 Ramos*, from Maunan, Cagayan Province, Luzon, April, 1909.

Loranthus polillensis sp. nov. § *Dendrophthoë.*

Epiphytica: floribus luteis, umbella pedunculata solitaria vel bina efformantibus, pentameris, petalis solutis: foliis verticillatis, ellipticis, rigidis, apice acutis vel acute acuminatis.

Flowers yellow, borne in solitary or paired umbels in the axils of present or fallen leaves, the peduncles 7 to 14 mm long, bearing at the apex 4 to 6 flowers, their pedicels 3 to 5 mm long; bract at the base of each flower ovate, acuminate, 1 mm long; free portion of calyx forming a rim about 1 mm high, more or less spreading; petals 5, separable to the base, about 23 mm long, 1.5 mm wide, the apical 5 mm free, tending to recurve, narrowly lanceolate, obtuse; filaments inserted in the throat of the corolla, the free part broad, 2 mm long; anthers exserted, basifixed, linear-oblong, 3 mm long, hardly wider than the filaments; ovary 2.5 mm long; style 2.5 cm long, persistent.

Glabrous; branches covered with light-gray bark; leaves in whorls of 5 to 7, the petioles 1 to 2 cm long, the lamina coriaceous, 8 to 15 cm long, 2.5 to 7 cm wide, the base acute, decurrent, the apex acute or more often acutely acuminate; venation, except the conspicuous midrib, very obscure.

POLILLO. *Bur. Sci. 10384 McGregor*, in flower, September 14, 1909. Allied to *L. halconensis* Merr., but distinguished by the different inflorescence, which is glabrous at all stages, and by various minor characters.

Other species: *L. pentapetalus* Roxb., *10333*, *10350*.

OPILIACEAE.

Opilia amentacea Roxb., *9256*.

ARISTOLOCHIACEAE.

Aristolochia tagala Cham. & Schl., *9123*, *10380*, local name *parol-parulan*.

AMARANTHACEAE.

Achyranthes aspera Linn., *9136*; *A. indica* (Linn.) Mill., *9224*: *Amaranthus spinosus* Linn., *9152*, local name *oori*.

PORTULACACEAE.

Portulaca oleracea Linn., *9175*.

RANUNCULACEAE.

Clematis smilacifolia Wall., *10409*, growing almost at sea-level, in the outermost fringe of vegetation along the coast, the actual strand plants excepted.

MENISPERMACEAE.

Pycnarrhena sp.

What seems to be an undescribed species of this genus, *10324*, sent to Doctor Diels for identification, has been returned by him with the note: "characteribus inter P. borneensem et P. ellipticam quasi intermedia, floribus ignotis describi non potest."

Other species: *Cissampelos pareira* Linn., *6881*, *9241*, *9264*, *10381*.

ANNONACEAE.

Drepananthus longiflorus sp. nov.

Arbor: inflorescentiis paucifloris, pedicellis longis, floribus trimeris, petalis in alabastro valvatis, subaequilongis, exterioribus applanatis, interioribus basi concavis genitalia occultantibus: foliis anguste oblongo-obovatis ad ovalibus, basi acutis apice acuminatis, venis utrinque 6 vel 7.

Inflorescences axillary, extra-axillary, or below the leaves, 1- to 3-flowered, the woody peduncles 2 to 3 mm long, forking except when 1-flowered into branches like themselves; pedicels slender, 2 to 3 cm long, bracted at the base and again 5 to 8 mm above it, the bracts obovate to suborbicular, about 2 mm long, decurrent at the base, like the peduncles and pedicels more or less ferruginous-pubescent: sepals 3, free nearly to the base, broadly oval, 7 mm long, pubescent on the outer surface; petals 6, valvate in bud, in flower the 3 outer 2.5 to over 4 cm long in different flowers, the basal 6.5 mm slightly concave, orbicular-ovate, forming a slight ridge on the inner surface, the limb spreading, flat, about 1 cm wide, narrowly elliptic, obtuse, the inner 3 petals slightly longer than the outer but the limb only half as wide, the concave bases more or less adnate at the neck and completely covering the stamens and carpels, all petals slightly pubescent on the outer surface; stamens numerous, about 1 mm long, the connective slightly produced and covering the apex of the anthers; carpels several, densely pubescent, about 1.5 mm long, usually 4-ovuled; fruiting carpels seen up to 15 in number, and up to 7.5 mm long though probably still immature, the cavity dividing into 2 or 3 compartments.

Probably a tree: the branchlets covered with dark-brownish or black bark, nearly glabrous except toward the extremities: petioles 1.5 to 2.5 cm long, the lamina thinly chartaceous, narrowly oblong-obovate or rarely oval, 10 to 19 cm long, 6 to 7.5 cm wide, the base acute, the apex abruptly contracted into a slender obtuse acumen 5 to 15 mm long, more or less pubescent on the under surface of the midrib, otherwise glabrous; primary lateral veins on each side of the midrib 6 or 7, projecting on the under surface, both they and the finer reticulations conspicuous on both surfaces.

POLILLO, *Bur. Sci. 10353 McGregor.* Allied to *D. ramuliflorus* Maingay and *D. philippinensis* Merr., differing from both in its longer flowers and pedicels, and from the former in the more numerous carpels. The fourth species of the genus, the second for the Philippines.

Polyalthia oblongifolia sp. nov.

Arbor: inflorescentiis ramifloris paucifloris pubescentibus; floribus viridibus, trimeris, petalis in alabastro valvatis, exterioribus quam interiores paullo longioribus sed angustioribus haud genitalia occultantibus: foliis breviter petiolatis, glabris, oblongis vel anguste oblongo-ovatis, basi rotundatis, venis utrinque circiter 12.

Inflorescences on tubercles on the branches below the leaves, 1- to 4-flowered, the pedicels fascicled, 4 to 15 mm long, with bracts at the base and usually also on the pedicels broadly ovate, clasping, obtuse, 1 to 2 mm long, the bracts pedicels sepals and the outer surface of the petals densely but shortly ferruginous-pubescent, the inner surface of the petals less so; sepals 3, semicircular, obtuse, 2.5 mm long, 4.5 mm wide; outer petals 3, coriaceous, very slightly concave at the base, otherwise flat and spreading, oblong-lanceolate, about 7 mm long and 2.5 mm wide, obtuse; inner nearly similar, triangular-ovate, about 6.5 mm long, 3.5 mm wide; stamens numerous, nearly 1 mm long, the connective shortly produced and covering the anthers; carpels numerous, shortly pedicelled, less than 1 mm long, densely pubescent at the truncate apex; ovules minute, very few, near the apex of the small cavity.

A tree, 7 m high with a trunk-diameter of 12 cm, the branches with gray and dark-brown bark; petioles stout, 6 to 7 mm long, lamina rigidly chartaceous, oblong or narrowly oblong-ovate, 13 to 21 cm long, 6 to 8.5 cm wide, the base rounded or subcordate, slightly inequilateral, the apex probably shortly acuminate; primary lateral veins about 12 pairs, these and the numerous reticulations conspicuous on both surfaces but especially beneath.

POLILLO, growing on beach north of Burdeos, *Bur. Sci. 9259 Robinson* (type). NEGROS, Himugaan River, *For. Bur. 17473 Curran*, with fruiting pedicels, but almost certainly the same. Most closely allied to *P. elongata* Merr., but distinguished by its much smaller flowers and shorter leaves.

Local names: *lanotan* (Polillo); *lanutan* (Negros).

Popowia polyandra (Presl) Merr. in Philip. Journ. Sci. 3 (1908) Bot. 224.

Represented by *9270, 10334*; other distribution Sorsogon, Batangas, Negros. and Mindanao.

Sageraea glabra Merr. in Bur. Govt. Lab. Publ. (Philip.) 35 (1906) 12.

Fruiting, *9300*; otherwise known only from the original collection, from southern Tayabas.

Unona sympetala sp. nov.

Floribus solitariis in ramis sub foliis longiter pedicellatis, trimeris; corolla basi sympetala, altius lobos 6 biseriatim dispositos efformante, lobis interioribus paullo brevioribus latioribusque, omnibus applanatis haud genitalia occultantibus; carpellis numerosis, ovulis uniseriatim dispositis: foliis brevissime petiolatis, oblongo-oblanceolatis, basi subauriculatis, apice caudato-acuminatis.

Pedicels solitary, from the axils of fallen leaves, 8.5 to 10 cm long, covered with dense spreading ferruginous pubescence as are the exterior surfaces of the sepals and corolla: sepals 3, ovate, acuminate, 6 mm long, at anthesis separate to the extreme base or earlier somewhat united; corolla greenish-white, united for 4 to 5 mm from the base, there about 1 cm in diameter, above forming 6 lobes arranged in two series, all flattened and ascending, those of either whorl well separated from one another but slightly overlapping those of the other whorl, not conspicuously dissimilar, the outer attaining 23 mm in length and 8 mm in width, the inner 20 mm and 9 mm respectively, in spite of their union the inner lobes traceable on the interior of the flower to its base: stamens numerous, 2 mm long, the filament 0.3 to 0.4 mm, the connective flattened above the anther-cells and concealing them from above; carpels about 20, 2 to 2.5 mm long, densely clothed with shining silky golden-brown pubescence; ovules several (about 8), arranged in one longitudinal row, quadrate, about 0.12 mm long.

Probably a small tree, the bark of the younger portions gray or pinkish-gray, wrinkled: leaves with stout pubescent petioles 4 to 10 mm long, the lamina chartaceous, oblong-oblanceolate, 30 to 48 cm long, 5.5 to 11 cm wide, the narrowed base slightly auricled, the apex forming a slender blunt acumen 3 to 4.5 cm long; primary lateral veins 15 to over 20, inconspicuous on the upper surface, but conspicuous on the under, as are the secondary and tertiary venation; midrib rather densely pubescent on the under surface, the primary veins slightly so, leaf otherwise glabrous.

POLILLO, *Bur. Sci. 10352 McGregor* (type). LUZON, Province of Isabela, San Luis, *Bur. Sci. 7999 Ramos*, fruiting but apparently quite the same. A species quite distinct from any other in the genus by reason of the united petals, the condition as evident in full flower as in bud. This has naturally cast suspicion upon the generic position here assigned but it seems in all other respects to fall within the limits of *Unona*.

Uvaria littoralis Blume Fl. Jav. Anon. (1828) 26, *pl.* 7: Miq. Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 7.

Unona littoralis Blume Bijdr. (1825) 16.

Apparently represented by *9254, 10328*. While this species has previously not been reported from the Philippines, this is rather a new and somewhat doubtful disposition of old material than a new discovery. There has been from the first much difference of opinion as to whether *U. ovalifolia* and *U. littoralis* should be held distinct, Miquel considering them separable on account of the thickened fruiting receptacles of the latter. The Polillo specimens are indecisive on this point, as one is in bud and the other in flower, but fruiting material from other Philippine localities which matches them well, has a well thickened receptacle. One of the Polillo collections was made on the coast, the exact locality of the other was not noted. The leaves are thinner than those of the majority of Javan specimens of this species in this herbarium, but quite as thick as those of X-A-51, from Buitenzorg, named as *U. littoralis* var. *miquelii* Boerl. Collections from Tayabas, Sorsogon, Mindoro, Panay, and Mindanao, seem also to be referable here.

Uvaria scandens C. B. Rob. in Bull. Torrey Bot. Club 35 (1908) 69.

Represented by *9278, 10389*. This seems to me exactly the same species as *U. zschokkei* Elmer, but the priority is not certain: probably *U. scandens* is slightly the older. While the specific name is indicative of my insufficient idea of the habit of the genus at the time it was given, it is very appropriate, as the Polillo plant is a fine liane, its apex lost from sight in tall trees at about 15 m, while its stems were in view, rambling through the forest for at least three times as far.

Other species: *Annona squamosa* Linn., *9161*, local name *atis*, apparently abandoned from cultivation: *Artabotrys rolfei* Vidal, *9262, 9267*: *Mitrephora lanotan* (Blanco) Merr., *10343*: *Phaeanthus ebracteolatus* (Presl) Merr., *6856*, probably, fruiting.

MYRISTICACEAE.

Knema heterophylla (F.-Vill.) Warb., *10344*.

LAURACEAE.

Cryptocarya (?) sp.

A fruiting specimen, *10774*, is most nearly matched among our collections by *C. everettii* Merr., but the fruits are differently shaped from those of that species. No flowers are present, and positive determination must be deferred.

Other species: *Cassytha filiformis* Linn., *6968*, *10433: Cinnamomum mercadoi* Vidal, *9261*, much valued for medicinal properties of the bark, local name *calingag: Litsea luzonica* (Blume) F.-Vill., *10323; L. tersa* (Linn.) Merr. (*L. sebifera* Pers.), *6960*, local name *marang*.

CAPPARIDACEAE.

Polanisia viscosa (Linn.) DC., *9175*.

NEPENTHACEAE.

Nepenthes alata Blanco, *10340*.

CRASSULACEAE.

Bryophyllum pinnatum (Lam.) Kurz is a common weed on the island, but being sterile was not collected.

CONNARACEAE.

Agelaea everettii Merr. in Philip. Journ. Sci. 4 (1909) Bot. 127.

The species is variable, and the two Polillo collections are at the extremes, *9063* having condensed inflorescences and small leaflets, *10396* having lax inflorescences and large leaflets, both are flowering and the stamens are 10 in number. Known also from Cagayan and Negros.

Connarus mindanaensis Merr. loc. cit. 122.

Otherwise known only from Mindanao. The Polillo collection, *6987*, is fruiting, and difficult to determine as between *C. mindanaensis* and *C. whitfordii*, also known only from Mindanao.

Other species: *Rourea volubilis* (Blanco) Merr., *6891*, with young flowers.

LEGUMINOSAE.

Clianthus binnendyckianus Kurz in Journ. As. Soc. Bengal 40² (1871) 51; Merr. in Philip. Journ. Sci. 5 (1910) Bot. 75.

Represented by *10767;* other distribution Mindanao, Celebes, and (?) Ceram.

Monarthrocarpus securiformis (Benth.) Merr. loc. cit. 89.

Represented by *10761;* other distribution Laguna, Mindanao, and Basilan.

Pithecolobium angulatum (Grah.) Benth. in Hook. Lond. Journ. Bot. 3 (1844) 208: Merr. loc. cit. 19.

Represented by *6869, 10765;* other distribution Tayabas, Masbate, Negros, Guimaras, Mindoro, and Palawan, Borneo, Java, Sumatra, Malay Peninsula, India.

Other species: *Abrus precatorius* Linn., *6967: Aeschynomene indica* Linn., *9024: Caesalpinia nuga* (Linn.) Ait., *9139; C. pulcherrima* (Linn.) Sw., *9170: Canavalia turgida* Grah., *9238: Cassia javanica* Linn., *9296; C. occidentalis* Linn., *9169*: *Crotalaria quinquefolia* Linn., *9238*: *Derris trifoliata* Lour., *6988*: *Desmodium heterocarpum* (Linn.) DC., *6879*; *D. triflorum* (Linn.) DC., *10766*: *Entada scandens* (Linn.) Benth., *9247*, *9269*: *Mimosa pudica* Linn., *9211*: *Mucuna gigantea* (Willd.) DC., *6868*, *9260*; *M. nigricans* (Lour.) Steud., *6969*: *Pahudia rhomboidea* (Blanco) Prain, *6982*: *Phaseolus calcaratus* Roxb., *10764*: *Pongamia mitis* (Linn.) Merr., *9089*, *10762*: *Sophora tomentosa* Linn., *9011*, *10762*: *Vigna lutea* (Sw.) A. Gray, *9284*. A few other species were seen sterile, all of wide distribution, but the paucity of the flora compared to that of the country near Manila, so far as this family is concerned, attracted early attention,[4] and the above list is the result of an especially determined attempt to secure a complete representation of those flowering or fruiting at the time.

OXALIDACEAE.

Oxalis repens Thunb., *9302*.

RUTACEAE.

Evodia glabra Blume, *9129*, *9228*, *10326*, local name *matang arao*: *Micromelum pubescens* Blume, *9218*, *9273*, local name *calay manoc*.

BURSERACEAE.

Canarium ovatum Engl. in DC. Monogr. Phan. 4 (1883) 110.

C. pachyphyllum Perk. Fragm. Fl. Philip. (1904) 94.

It seems to me quite impossible to distinguish *C. pachyphyllum* from the older species, certainly *Merrill 2067*, the only collection represented here that was cited in the description of *C. pachyphyllum* is good *C. ovatum*. The Polillo numbers are *9268* and *10356*, the local name is *pilaui* or less often *pili*. The species is otherwise known from Tayabas, Camarines, Albay, Sorsogon, Samar, Mindanao, and Basilan, to which the description of *C. pachyphyllum* would add Rizal.

Canarium perkinsiae Merr. in Bur. Govt. Lab. Publ. (Philip.) **35** (1906) 27.

Represented by *10367*, local name *palaspas*; other distribution Mindoro and Mindanao.

MELIACEAE.

Aglaia aherniana Perk. Fragm. Fl. Philip. (1904) 32.

Represented by *9137*, *10232*; other distribution Cagayan, Tayabas, Camarines, and Dinagat.

Amoora (§ Aphanamyxis) polillensis sp. nov.

Frutex: inflorescentiis staminiferis paniculatis, floribus breviter pedicellatis, albis; sepalis 5, liberis, pubescentibus; petalis 3, glabris; tubo primo integro, serius alte lobato, staminibus 6; ovario rudimentario: foliis quam inflorescentiae multo longioribus, imparipinnatis, 7-jugatis, foliolis petiolulatis, basi utrinque acutis, apice breviter obtuseque acuminatis.

Staminate inflorescences axillary, 20 to 25 cm long, the panicle-branches attaining a length of over 10 cm, or often much shorter, the pedicels 1 to 4 mm long, all minutely but somewhat densely pubescent: sepals 5, free, imbricate, unequal, nearly semicircular, the apex rounded or somewhat truncate, 1.5 to 1.7 mm long, 1.8 to 3 mm wide, pubescent on the outer surface and ciliate on the margins; petals 3, white, broadly oval with involute margins, 5 mm long, 4 mm wide, very obtuse, glabrous; tube campanulate, over 3 mm long, at first entire, later parted to the middle into 6 obtuse ovate or lanceolate lobes; anthers 6, dorsally attached at the level of the base of the lobes, nearly 3 mm long, oblanceolate; ovary rudimentary.

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[4] See Merrill in This Journal **5** (1910) Bot. 5.

A shrub, 2 m high, its stems about 3 cm in diameter, covered at the apex with reddish-brown, densely short-pubescent bark: leaves 50 to 80 cm long (excluding the leaflets), the petiole conspicuously enlarged at the base, at the first leaflets 5 to 6 mm in diameter, together with the rachis and petiolules more or less densely short-pubescent, petiolules unequal, 4 to 17 mm long, that of the odd leaflet 15 to 40 mm long, other leaflets 6 pairs, chartaceous, varying from oblanceolate through oblong to lanceolate, 11.5 to 32 cm long, 5 to 11 cm wide, acute on both sides at the inequilateral base, the apex forming an obtuse acumen 1 to 1.5 cm long; primary lateral veins 11 to 16, nearly straight near the midvein, arched toward the margins, the secondary, both those arising from the midvein and those at right angles to the primary, sufficiently conspicuous on both surfaces, the veins of the under surface pubescent like the petioles.

POLILLO, in forest east of the town, at an elevation of 20 m, *Bur. Sci. 6939 Robinson*. To this almost certainly is to be referred *Ahern 324*, from Surigao, Mindanao, differing chiefly in the less conspicuous secondary venation of the glabrous leaflets. The nearest alliance among described species seems to be with *A. perrottetiana* C. DC., from which it is easily distinguishable by the texture and other characters of the leaflets. Closely allied forms, though probably specifically distinct, have been collected in Ilocos Norte, Leyte, and Mindoro.

Dysoxylum altissimum Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 72.

This species is definitely known only in the flowering condition from Bataan, but *10233* with detached fruits is otherwise a good match. The walls of the globose fruits split nearly to the base into 4 elliptic valves, the scarlet-vermilion seeds are 3 cm long. The Polillo specimen is also fairly well matched by Mindanao material, which is probably distinct from the Bataan species.

Another species of this genus seems to be represented by *10770*, also fruiting, more closely resembling *D. venosum* Merr., from Cagayan, than any other, but still not perfectly.

Other species: *Sandoricum indicum* Cav., *6996*: *Xylocarpus obovatus* A. Juss., *9268*.

MALPIGHIACEAE.

Tristellateia australis A. Rich., *6952*, *10435*.

EUPHORBIACEAE.

Antidesma macgregorii sp. nov.

Arbuscula: inflorescentiis staminiferis spicatis, floribus haud confertis, sessilibus, bracteis ovatis, ciliatis; calyce discoque obscure 4-lobatis, hoc glabro; staminibus 4: foliis saepissime ellipticis, utrinque attenuatis, basi acutis, apice acute acuminatis; venis utrinque circiter 7, laxe anastomosantibus, conspicuis.

Staminate inflorescences spicate, 4 to 9 cm long, the flowers well separated; bracts ovate, 0.5 mm long, ciliate; calyx urceolate, about 0.7 mm long, obscurely showing 4 acuminate lobes, minutely pubescent or at least ciliate; disk 0.3 mm long, obscurely 4-lobed, glabrous; stamens 4, filaments 1.5 mm long, anthers extrorse, 0.4 mm long; rudimentary ovary glabrous.

A small tree, its ultimate branches covered with grayish-yellow striate bark, all vegetative parts glabrous: petioles 4 to 10 mm long, rather stout, lamina chartaceous, elliptic, elliptic-oblanceolate, or oblong-oblanceolate, 11 to 17 cm long, 3.5 to 5.5 cm wide, the base acute, the apex forming an acute acumen about 2 cm long, the upper surface plumbeous, the under surface somewhat brownish; primary lateral veins on each side of the midrib 6 to 8, conspicuously and loosely anastomosing, and forming a definite lateral vein; stipules caducous, lanceolate, 4 mm long.

POLILLO, *Bur. Sci. 10280 McGregor* (type). LUZON, Province of Cagayan, Claveria, *Bur. Sci. 7397 Ramos;* east coast, locality with no known name, *Bur. Sci. 10583 McGregor.* Allied to *A. bunius* (Linn.) Spr., but distinguished by the 4 stamens, the much more conspicuous leaf-venation, and other characters.

Aporosa microcalyx (Hassk.) Hassk. in Bull. Soc. Bot. France **6** (1859) 714.

Represented by *9074, 9306, 10275;* other distribution Isabela, Albay, and Samar; Borneo, Banka, Java, Malay Peninsula, a variety in China.

Glochidion benguetense Elmer Leafl. Philip. Bot. **1** (1908) 304.

This, or at least *G. sablanense* Elmer, the types of which seem to me different stages of development of the same species, known otherwise from Benguet and Tayabas, is represented by *6878* and *10274*.

Glochidion littorale Bl. Bijdr. (1825) 585.

Represented by *9145;* other distribution Tayabas, Mindoro, Panay, Mindanao, Borneo, Java, Sumatra, India.

Glochidion mindorense C. B. Rob. in Philip. Journ. Sci. **4** (1909) Bot. 98.

This species, represented by *9293*, should be placed nearer to *G. rubrum* than was indicated in the original description, as the stylar column is ordinarily less widened apically than there stated; the cells of the ovary vary from 4 to 6.

Glochidion sp.

A collection with much the appearance of *G. camiguinense* Merr. and *G. merrillii* C. B. Rob. is represented by *6994*, differing from the former in the well developed stylar column and from the latter by 4-celled ovaries and capsules. Its true alliance is probably the latter, but as no staminate flowers were found, and as the section can not be determined with certainty, it is left undescribed.

Other species: *Antidesma edule* Merr., *10279: Breynia cernua* Muell.-Arg., *6873, 10277: Codiaeum variegatum* (Linn.) Blume, *10777: Croton tiglium* Linn., *9222: Euphorbia hirta* Linn., *9146; E. atoto* Forst., *6962*, local name *hauili: Excoecaria agallocha* Linn., *6983, 10273,* local name *lipatang babaye: Glochidion breynioides* C. B. Rob., *10276; G. lancifolium* C. B. Rob., *10272; G. triandrum* (Blanco) C. B. Rob., *9226: Macaranga bicolor* Muell.-Arg., *6872; M. tanarius* (Linn.) Muell.-Arg., *9121*, local name *binunga: Mallotus ricinoides* (Pers.) Muell.-Arg., *9130, 10278*, local name *cahoy dalaga; M. playfairii* Hemsl., *6989: Phyllanthus reticulatus* Poir., *9148; P. urinaria* Linn., *6956, 9073; Ricinus communis* Linn., *9165*.

ANACARDIACEAE.

Buchanania arborescens (Blume) Blume, *6979*, local name *niogniogan*.

ICACINACEAE.

Iodes philippinensis Merr. in Philip. Journ. Sci. **3** (1908) Bot. 241.
Represented by *9263*; other distribution Leyte, Masbate, Cebu, Romblon, Mindoro, Palawan.

Phytocrene blancoi (Azaola) Merr. in Philip. Journ. Sci. **2** (1907) Bot. 432.
Represented by *10339*; other distribution Bulacan, Rizal, Laguna, Leyte, and Mindanao.

SAPINDACEAE.

Allophylus leucocladus Radlk. supra 181.
Only known collection, *6880*.

Allophylus ternatus (Forst.) Radlk. in Engl. & Prantl Nat. Pflanzenf. **3**⁵ (1895) 313.
Represented by *6953*; other Philippine distribution Cagayan, Tayabas, Albay, Leyte, Mindoro, Mindanao, Basilan, and Zambales.

Dictyophora rhomboidea Radlk. supra 182.
Only known collection, *10359*.

Mischocarpus sundaicus Bl. Bijdr. (1825) 238.
Represented by *9070*, *9179*; other Philippine distribution Nueva Ecija, Davao; local name *salab*.

Otophora oliviformis Radlk. supra 181.
Only known collection, *10330*.

Trigonachras cuspidata Radlk. supra 182.
Only known collection, *For. Bur. 1411 Hagger*.

RHAMNACEAE.

Colubrina asiatica (Linn.) Brongn., *6955*, local name *cabatiti*: *Gouania microcarpa* DC., *6882*, *9069*.

VITACEAE.

Ampelocissus imperialis (Miq.) Planch. in DC. Monogr. Phan. **5** (1887) 408.
This species, or more exactly the variety *lobata*, is represented by *10773*; other distribution (species and variety) Tayabas, Mindanao, Culion, Sumatra, Borneo, probably Java.

Leea congesta Elmer Leafl. Philip. Bot. **1** (1908) 318.
Two collections, *6850* and *10375*, both fruiting, agree well with the type material, except that the leaflets and petioles are longer. Other distribution Ilocos Norte, Benguet, Rizal, Tayabas, Mindanao.

Leea negrosensis Elmer Leafl. Philip. Bot. **2** (1908) 494.
It seems probable that this species is represented by *6839*, the inflorescence and flowers being entirely similar, except that the calyces are minutely pubescent and smaller by half than as described for the type, agreeing in this respect with the specimen of the latter here, both differences probably due to difference in age. There is more difficulty with the leaves. Of the Polillo plant, two leaves

were preserved. The petioles are 25 to 30 cm in length to the first leaflets, the rachis thereafter being in one 18 cm long, in the other nearly 40 cm long. At the first node, the lateral secondary petioles are over 10 cm long, with three leaflets; the apical node also bears three leaflets, the intermediate node in one leaf has a single leaflet on either side, in the other leaf bears three leaflets on a secondary petiole. The veins of the under surface of the leaves are minutely pubescent, in the type material this is confined to the bases of the principal veins, while in *Merrill 5240*, from Lanang, Samar, which is otherwise quite the same as the Polillo plant, the leaflets are glabrous. In both of these the leaves as a whole and the leaflets are larger than in the Negros specimens, but in shape, serration, and venation, essentially the same.

Leea parva Elmer Leafl. Philip. Bot. 1 (1908) 317.

Well matched by *6854*, fruiting, the species not otherwise known with certainty, except from the type collection, from Tayabas. The petioles are about 15 cm long, slightly exceeding those of the type, 10 to 12 cm; the petiolules of the leaflets, the terminal excepted, vary from 5 mm to 1 cm.

Tetrastigma glabratum (Blume) Planch. in DC. Monogr. Phan. 5 (1887) 430.

A series of Philippine collections, including *10373*, seems to fall under this species, but in the absence of material for comparison, the identification is best considered provisional. The chief difference is that the calyx of the Polillo specimen is only obscurely lobed, and that the leaflets are not subcoriaceous; however, the latter objection does not apply to other collections apparently also referable here from Mindoro, Mindanao, and Palawan. These are mostly fruiting, none has a style as long as that of the Polillo plant, which is quite as described for this species by Planchon. The proportions of the flowers vary somewhat with age, so that it is a matter of some doubt whether another collection, *10400*, should also be referred here, but it is probably a different species.

Other species: *Cissus adnata* Roxb., *6877*, mature leaves glabrescent.

TILIACEAE.

Colona serratifolia Cav., *9006*, *10283*, *10406*, local name given as *lauan*.

MALVACEAE.

Abutilon indicum (Linn.) G. Don, *9048*, local name *marbas*: *Hibiscus rosa-sinensis* Linn., *9236*; *H. surattensis* Linn., *9305*: *Paritium tiliaceum* (Linn.) A. Juss., *9062*, local name *balibago*: *Sida acuta* Burm., *10360*; *S. retusa* Linn., *9210*: *Urena lobata* Linn. (*U. sinuata* Linn.), *9304*.

STERCULIACEAE.

Heritiera littoralis Dryand., *9075*: *Melochia corchorifolia* Linn., *9220*; *M. indica* (Houtt.) A. Gray, *9012*: *Sterculia cuneata* R. Br., *6899*, *10390*: *Theobroma cacao* Linn., cult., *9272*.

DILLENIACEAE.

Saurauia whitfordii Merr. in Bur. Govt. Lab. Publ. (Philip.) 35 (1906) 42.

This species, otherwise known only from Tayabas, is represented by *10258*.

Other species: *Dillenia philippinensis* Rolfe, *9232*, *10346*, local name *cotmon*.

THEACEAE.

Thea montana (Blanco) Merr., *9185*.

GUTTIFERAE.

Garcinia subelliptica Merr. in Philip. Journ. Sci. 3 (1908) Bot. 361.

Represented by *10321*; other distribution Cagayan, Tayabas, Camarines.

Other species: *Calophyllum inophyllum* Linn., *9249*: *Kayea paniculata* (Blanco) Merr., *9186*: *Cratoxylon formosum* (Jack) Dyer, *9258*.

DIPTEROCARPACEAE.

(Identified by Dr. F. W. Foxworthy.)

Anisoptera curtisii Dyer ex King in Journ. As. Soc. Bengal 62 ² (1893) 100.

Represented by *For. Bur. 3218 Hagger*; other Philippine distribution Laguna, Camarines.

Dipterocarpus pilosus Roxb. Fl. Ind. 2 (1832) 615.

Represented by *18281*; other Philippine distribution Cagayan, Tayabas, Camarines, Marinduque, Mindoro, Samar, Leyte, Mindanao.

Parashorea plicata Brandis in Journ. Linn. Soc. Bot. 31 (1895) 104.

Represented by *10282*, *6831* in part, leaves; other Philippine distribution Tayabas, Bulacan, Rizal, Laguna, Camarines, Albay, Sorsogon, Leyte, Masbate, Negros, Mindanao.

Shorea squamata (Turcz.) Benth. & Hook. f. Gen. Pl. 1 (1862) 193.

Represented by *For. Bur. 3217 Hagger*, in part, *10778*; other Philippine distribution Ilocos Norte, Cagayan, Isabela, Tayabas, Bulacan, Laguna, Camarines, Albay, Sorsogon, Mindoro, Marinduque, Samar, Leyte, Mindanao.

Shorea teysmanniana Dyer ex Brandis in Jour. Linn. Soc. Bot. 31 (1895) 100.

Represented by *10284*, *10782*; other Philippine distribution Ilocos Norte, Cagayan, Tayabas, Bulacan, Camarines, Albay, Sorsogon, and Mindanao.

Other species: *Dipterocarpus vernicifluus* Blanco, *10781*: *Hopea pierrei* Hance, *10285*: *Pentacme contorta* (Vidal) Merr. & Rolfe, *For. Bur. 3217 Hagger*, in part, *6831*, in part, fruit, *10379*: *Vatica* sp., *10783*.

FLACOURTIACEAE.

Flacourtia inermis Roxb., *9125*, *10410*, local name *amayit*: *Scolopia luzonensis* Warb., *9303*, *10376*.

PASSIFLORACEAE.

Adenia coccinea (Blanco) Merr., *10399*.

BEGONIACEAE.

Begonia leptantha sp. nov. § *Petermannia*.

Inflorescentiis ex axillis superioribus oriundis, staminiferis cymosis, pistilliferis unifloris staminiferarum basi positis; floribus staminiferis parvis, sepalis 2; fructibus obovatis, apice truncatis, trialatis: foliis oblique obovatis, inaequilateralibus, basi angustatis, apice breviter acuminatis, marginibus grosse dentatis vel modo sinuatis.

Inflorescences from the axils of the uppermost leaves, hence usually appearing terminal, the staminate cymose, 6 to 12 cm long, the pistillate one-flowered, at the base of the staminate; axes of the inflorescence densely covered with reddish-brown pubescence; bracts at the nodes of the cyme lanceolate, acuminate, about 3.5 mm long, bracteoles upon the pedicels similar but more slenderly acuminate, about 1 mm long: sepals of staminate flowers 2, red at the central part of the base, elsewhere white, suborbicular to ovate, 3.5 to 5 mm long, 4.5 to 6 mm wide, rounded, truncate, or slightly cordate at the base, rounded at the apex, often with pubescence similar to that of the pedicels on the part of the outer surface overlying the anthers; petals none; stamens about 40, the filaments for the whole or nearly the whole of their length united into a column, the anthers oblong-oblanceolate, 1 to 1.3 mm long, notched at the apex: capsule upon a pedicel 3 to 4 mm long, obovate, the apex truncate, 1.6 cm long and wide, sharply 3-winged, 3-celled.

Plants terrestrial, erect, with a somewhat woody base, 30 to 50 cm high, often branched at the base, the stems with pubescence similar to that of the inflorescence but darker-colored: leaves alternate but often opposed by short lateral branches; petioles 3 to 10 mm long, the lamina obliquely obovate, strongly inequilateral, the longer and wider side not produced at the base more than 2 mm beyond the other, slightly auricled or rounded, the shorter side usually acute, the apex forming an obtuse or acute acumen not exceeding 1 cm in length, the margins sometimes merely obscurely sinuate but much more often toward the apex with shallow but broad teeth, the teeth very obtuse to acute; 5- to 7-plinerved at the base, with 2 to 4 additional veins on each side of the midrib; pubescence like that of the stem present upon the petioles, the veins and to a much less extent the intervening tissue of the under surface, the last also lepidote.

POLILLO, *Bur. Sci. 6857* (type), *6944 Robinson*, *Bur. Sci. 10322 McGregor*. LUZON, Province of Tayabas, Mahabangsugsugan River (Siniloan trail), *Bur. Sci. 9474 Robinson*. Closely allied to *B. jagori* Warb., but distinguished by the smaller flowers, narrower anthers, and less toothed leaves. It has even greater superficial resemblance to an undescribed species from Mindanao, but a very different inflorescence.

Other species: *Begonia pseudolateralis* Warb., *6903*.

THYMELAEACEAE.

Phaleria perrottetiana (Meissn.) F.-Vill., *10329*.

SONNERATIACEAE.

Sonneratia pagatpat Blanco, *6964*, *9485*, *10382*, local name *pagatpat*.

PUNICACEAE.

Punica granatum Linn., probably cultivated only, *9168*, local name *granada*.

LECYTHIDACEAE.

Barringtonia racemosa Blume, *9020*, local name *putat; B. asiatica* (Linn.) Kurz, was seen from a boat, but not collected.

RHIZOPHORACEAE.

Gynotroches axillaris Bl. Bijdr. (1825) 261.

Represented by *10361;* other Philippine distribution Tayabas, Mindoro, Dinagat, Mindanao, Negros.

Other species: *Bruguiera gymnorrhiza* Lam., *9010*, local name *pototan; B. parviflora* W. & Arn., *9116*, local name *hingalay: Ceriops tagal* (Perr.) C. B. Rob., *9297*, local name *tangal: Pellacalyx pustulata* Merr., *6870*, local name *quibal: Rhizophora mucronata* Lam., *9291*, local name *bancao.*

COMBRETACEAE.

Lumnitzera littorea (Jack) Voigt, *9115*, local name *libatu: Quisqualis indica* Linn., *9230: Terminalia edulis* Blanco, *10369; T. catappa* Linn., common along the shores, but sterile, was not collected.

MYRTACEAE.

Eugenia macgregorii C. B. Rob. in Philip. Journ. Sci. 4 (1909) Bot. 367.

When originally described, this species was placed far from its nearest ally, *E. mimica* Merr., through an attempt, seemingly vain, to draw a dividing line between the species with well developed calyx-lobes and those where the lobes are little developed or wanting. Of these two groups of species, and of *E. macgregorii* and *E. mimica*, the same statement may be made: the extremes are very different, but they pass by very easy stages into one another. The type of *E. macgregorii* has not only larger flowers with somewhat better developed calyx-lobes than that of *E. mimica*, but the leaves (allowing for difference in length) are over twice as wide, and the marginal vein is less notched at its junctions with the laterals. It is moreover a small tree along coasts, often in mangrove swamps, typical *E. mimica* is a low bush, inland. Polillo collections, *9144*, *10392*, are typical *E. macgregorii*, and here also must be referred all plants from Tayabas and Camarines previously cited by me under *E. mimica*. The intermediates are from Zambales, Bataan, Mindoro, and Zamboanga. Were hybrids known to occur in the genus, such collections as *Williams 381*, from Bataan, and *For. Bur. 386 Maule*, from Zambales, might well be so considered, as they have some characters of the one species, and some of the other.

Eugenia mindanaensis C. B. Rob. l. c. 363.

Having seen this in the field, in Mindanao, I may add that the fruit is similar to that of *E. javanica* Blume, which is its close ally, but that it seems to show constantly the characters noted as distinctive from that species. The Polillo collection, *10365*, has rather smaller leaves, more narrowed at the base, than those from the southern islands, but must be referred here. Other distribution Dinagat, Mindanao, Basilan.

Eugenia subrotundifolia C. B. Rob. l. c. 362.

Batanes, Ilocos Norte, Cagayan, Tayabas, Albay, Sorsogon; Polillo, *10347*.

Osbornia octodonta F. Muell. Fragm. 3 (1862) 31.

Polillo is the most northern station now known, in mangrove swamps about 6 km north of the town, *9117*, local name *maligang;* other distribution Tayabas, Camarines, Leyte, Negros, Panay, Mindanao, Basilan, Palawan, and Australia.

Tristania sp.

A species, believed to be of this genus, has now been collected several times, always sterile, from Polillo, *9112*, local name *dinglas*, Camarines, Albay, Leyte, and Mindanao. Its wood is of commercial importance.

Other species: *Decaspermum paniculatum* (Lindl.) Kurz, *6985, 10342, 10436*, local name *guyong-guyong*; *Psidium guajava* Linn., *6876*, local name *bayabas*.

MELASTOMATACEAE.

Astronia williamsii Merrill sp. nov.

Arbuscula 2 ad 3 m alta: paniculis quam folia multo brevioribus, brunneo-furfuraceis vel lepidotis, multifloris; floribus 5-meris, 2 ad 2.5 mm longis: foliis chartaceis, oblongo-ellipticis, usque ad 20 cm longis, apice breviter acuminatis, basi acutis 5-plinerviis, nervulis transversalibus prominentibus, supra glabris, subtus plus minusve dense et minute pallido-lepidotis, nervis nervulisque plus minusve brunneo-furfuraceis, vetustioribus subglabrescentibus.

Panicles terminal, uniformly dark-brown-furfuraceous or lepidote, many-flowered, 3 to 9 cm long, 6 to 10 cm wide, the flowers subumbellately disposed on the ultimate branchlets: flowers yellowish-white, their pedicels brown-furfuraceous, 2 mm long; calyx urceolate-campanulate, 2 to 2.5 mm long and wide, in very young fruit 3 mm, brown-furfuraceous, with 5 broad, short, acute teeth about 0.8 mm long; petals orbicular, about 1.7 mm in diameter, deciduous; anthers obovoid, 0.8 mm long; style 2 mm long.

A shrub 2 to 3 m high, its branches light-gray, glabrous, terete, the younger parts rather densely furfuraceous or lepidote with small, dark-brown scales: leaves elliptic-oblong, chartaceous, 10 to 20 cm long, 4 to 9 cm wide, the apex sharply but rather shortly acuminate, base acute, the upper surface glabrous, green, somewhat shining, the lower surface rather uniformly and densely minutely subcinereous-lepidote, the nerves and nervules distinctly brown-furfuraceous, in age becoming subglabrous; nerves 5, the outer pair leaving the midrib nearly at the base, the inner pair at from 5 to 10 mm above the base, all reaching the apex, a very faint marginal pair sometimes also present, the transverse veinlets prominent, distant, subparallel, numerous; petioles densely brown-furfuraceous or lepidote, 2.5 to 3.5 cm long.

LUZON, Province of Bataan, Mount Mariveles, *Williams 722*, March, 1904 (type): Province of Rizal, San Isidro, *Phil. Pl. 451 Ramos*, June, 1910: Province of Laguna, San Antonio, *Bur. Sci. 10927 Ramos*. POLILLO, *Bur. Sci. 9114 Robinson*, August, 1909. Allied to *Astronia pulchra* Vid. and *A. cumingiana* Vid., but with larger, 5-nerved leaves, differing from *A. rolfei* Vid. by its leaves being lepidote and furfuraceous beneath and having more numerous nerves, from *A. meyeri* Merr. by the leaves not being densely covered with papery brown scales and somewhat in its venation. The San Isidro and Polillo plants have somewhat smaller flowers than the type, but they are also less mature.

Medinilla annulata sp. nov.

Erecta, scandens: inflorescentiis solitariis vel fasciculatis, in caulibus vetustioribus suffultis, pedunculis longis, gracilibus, floribus apice umbellato-cymosis, pentameris, calyce annulato: ramulis setosis; foliis petiolatis, laminis ellipticis vel anguste obovatis, basi leviter cordatis, apice abrupte brevissimeque acuminatis, nervis utrinque 4.

Inflorescences solitary or fascicled on the lower portions of the stem below the leaves, 13 to 20 cm long, the peduncle only 1.5 mm in diameter, minutely setose at the apex, densely setose at and sometimes near the base, elsewhere with scattered setae or glabrous, the inflorescence otherwise glabrous, the flowers usually numerous, confined to its apex and forming an umbellate cyme, the pedicels 5 to 12 mm long: calyx united with the ovary for rather more than 2 mm, the free portion somewhat shorter, abruptly widened, its apex with 5 minute teeth, its inner surface bearing a conspicuous annulus nearly opposite the free apex of the ovary, the outer surface of the calyx showing when fresh 5 or less definitely 10 pink ribs, these inconspicuous in dried material; petals 5, greenish-white, obovate or oblanceolate, apiculate, 6 mm long; stamens 10, subequal, their filaments yellow, nearly 4 mm long, the blue anthers lanceolate, reflexed before anthesis, slightly incurved in flower, 3.5 mm long, two anterior appendages at the base of the anther-cells ovate, 0.4 mm long, obtuse, the posterior spur 0.2 mm long, being the continuation of a narrow keel extending 1 mm up the dorsal surface of the connective; style narrowly clavate, 4 mm long; ovary globose, 5-celled, its apex in young flowers with 5 pairs of conspicuous ridges, but these inconspicuous in later stages, ovules very numerous, on placentae attached near the apex of the central angle of the cells: fruit purplish-red, succulent, seen up to 4.5 mm in diameter.

Woody and erect, but climbing along the trunks of trees, the stems nearly cylindric, the older branches covered with scaly brownish bark, the younger increasingly setose, densely so at the nodes: leaves opposite, the petioles 18 to 35 mm long, they and the bases of the midvein of the under surface somewhat setose, the veinlets of the under surface sparingly setose, the leaves otherwise glabrous, lamina submembranaceous, elliptic to narrowly obovate, 20 to 25 cm long, about 9 cm wide, the base shallowly cordate, the apex rounded and abruptly forming an acumen only 2 to 3 mm long; lateral veins on each side of the midrib 4, arched-ascending, the uppermost continuing into the acumen, the third pair nearly as far, all united with the midvein and succeeding veins by conspicuous transverse veinlets.

POLILLO, San Francisco, *Bur. Sci. 9002 Robinson* (type), on low hills beside a stream at about 30 m elevation, *Bur. Sci. 10265 McGregor*. A singularly distinct species, perhaps as near to *M. cephalophora* Merr. and that herein

described as *M. polillensis* as to any other, but very different from both, as they are from one another, in the inflorescence, differing also by the more numerous leaf-veins, the pubescence, and in many other ways.

Medinilla cephalophora Merr. in Philip. Journ. Sci. 3 (1908) Bot. 250. Represented by *10261;* other distribution Laguna, Negros, Mindanao.

Medinilla inaequifolia sp. nov.

Suffrutex, saepe prostratus, M. involucratae Merr. affinis; inflorescentiis saepissime bifloris insigniter bracteolatis, calyce dense pubescente 5-dentato: foliis oppositis, valde diversis, uno saepissime elliptico vel oblanceolato, apice acute acuminato, basi rotundato vel subcordato; altero multo breviore, orbiculare vel ovato-orbiculare, basi cordato.

Inflorescences terminal, lateral, or sometimes crowded on lateral branches; basal pair of bracts lanceolate, acute, about 4 mm long, peduncle about 3 mm long, bearing at its apex a pair of bracts similar to those at its base, each subtending a single one-flowered pedicel about 2 mm long; each flower inclosed in a pair of ovate, rose-carmine bracteoles about 2 cm long, 9-plinerved, their under surface and margins, the peduncles, pedicels, and bracts with hairs 1 to 4 mm long: fruiting calyx 7 mm long, extending about 1 mm beyond the ovary, densely beset with hairs often as much as 5 mm long and overtopping it, annulate within, the rim of the calyx forming 5 cuspidate teeth and minutely serrate between them; ovary 5-celled; ovules very numerous.

An undershrub, at least sometimes prostrate, the gray branches densely fulvous-pubescent: leaves opposite, those of a pair strikingly dissimilar, the one with densely pubescent petioles 7 to 10 mm long, the submembranaceous lamina variable in outline but more frequently elliptic or oblanceolate, 10 to 18 cm long, 3 to 6 cm wide, the base rounded, rarely very shortly acuminate, or subcordate, the apex acutely short-acuminate, 9- to 11-plinerved, both surfaces bearing upon the veins and between them numerous hairs usually about 3 mm long, the opposing leaves sessile, orbicular or ovate-orbicular, 2 to 2.5 cm long, the base cordate with a very narrow sinus, the apex abruptly and very shortly acuminate, 7- to 9-plinerved.

POLILLO, *Bur. Sci. 10264 McGregor* (type), *Bur. Sci. 9095 Robinson*, not uncommon. LUZON, Province of Tayabas, Mount Binuang, at 875 m elevation, *Bur. Sci. 9382 Robinson.* Very similar to *M. involucrata* Merr. in the general appearance of the bracteoles and the unequal leaves, but at once distinguishable by the pubescence and the more numerous leaf-nerves.

Medinilla involucrata Merr. in Philip. Journ. Sci. 2 (1907) Bot. 287. Represented by *6947, 10262;* other distribution Tayabas, Camarines, Albay, Sorsogon, Negros, Mindoro, Mindanao.

Medinilla nodiflora sp. nov.

Suffrutex, scandens: cymis in caulibus sub foliis fasciculatis, brevibus; floribus pentameris: foliis oppositis, laminis chartaceis, ellipticis vel elliptico-lanceolatis, basi rotundatis vel cordatulis, apice breviter acuminatis, 7-plinerviis vel infimis obscuris.

Cymes fascicled on tubercles on the stem below the leaves, 3 to 4 cm long, the flowers in whorls of 3 to 6 at the ends of their branches, on pedicels 5 to 8 mm long; fruiting calyx waxy-white, urceolate, 10 mm long, 8 mm in diameter, free from the ovary for about 2 mm, the rim fleshy at the base, annulate within, the nearly truncate apex obscurely showing 5 minute teeth; ovary 5-celled; seeds very numerous, less than 1 mm long, the testa horny.

Woody, climbing on trees and often rooting, the stems cylindrical, about 1 cm in diameter, glabrous, with gray or dark-gray bark: leaves opposite, the petioles 2.5 to 5 cm long, the lamina chartaceous, elliptic or elliptic-lanceolate, 13 to 20 cm long, 4.5 to 9 cm wide, the base rounded or very shallowly cordate, the apical acumen acute or subacute, 8 to 15 mm long, 7-plinerved, the lowest pair basal or subbasal, extending about two-thirds the length of the leaf, sometimes obscure, the next pair arising 5 mm or less from the base or often adnate to the midvein and basal or subbasal, extending into the acumen, the apical pair about 3.5 cm above the base, reuniting with the midrib near the base of the acumen, upper surface green, glabrous, under surface tending to become purplish-brown in drying, its veins, the petioles and pedicels minutely brown-furfuraceous, transverse veinlets much more distinct on upper surface.

POLILLO, *Bur. Sci. 10263 McGregor*. LUZON, Province of Laguna, San Antonio. Papatahan, *Bur. Sci. 12005 Ramos* (type). Allied to *M. curranii* Merr., strongly resembling it in its fruit, but having merely opposite leaves, 7-plinerved.

Medinilla polillensis sp. nov.

Scandens: floribus saepissime in triadibus rarius in triadibus biverticillatis caulinis dispositis, tetrameris: foliis chartaceis, lanceolatis, glabris, basi obscure et brevissime auriculatis, apice acuminatis, 5-plinerviis.

Inflorescences cauline, the flowers more often 3, disposed umbellately, or in two whorls each of 3, the peduncle 1.5 to 2.5 cm long, the pedicels articulated, below the articulation 2.5 to 5 mm long, from articulation to the base of the ovary 1 to 1.4 cm long: fruiting calyx urceolate, 8 mm long, annulate within, the rim about 1.5 mm long, forming 4 rounded lobes; ovary thin-walled, 4-celled, ovules very numerous.

Plant entirely glabrous, scandent on tree-trunks, and rooting at the nodes, the stems and branches strongly quadrangular and usually with papyraceous wings: leaves with petioles 2.5 to 5 cm long, the lamina chartaceous, lanceolate or broadly lanceolate, 15 to 24 cm long, 5 to 9 cm wide, the base most often obscurely auriculate and subpeltate, the apex gradually narrowed into an acumen 1 to 2 cm long, 5-plinerved, all other venation very obscure, upper surface olivaceous, the under surface brownish.

POLILLO, *Bur. Sci. 10260 McGregor* (type), *Bur. Sci. 6859 Robinson.* Very distinct from any other Philippine species, and apparently from any of other regions, resembling vegetatively *M. clementis* Merr. and *M. cephalophora* Merr., but having an entirely different inflorescence; perhaps most closely allied to *M. motleyi* Hook. f.

Other species: *Astronia cumingiana* Vidal, *9270*: *Melastoma polyanthum* Blume, *6875*, local names, *tungao tunguauan*, *buslugan*: *Memecylon edule* Roxb., *10266*; *M. cumingianum* Presl, *10259*; *M. paniculatum* Jack (?), *9274*.

ONAGRACEAE.

Jussiaea suffuticosa Linn., *9042*, *10349*.

ARALIACEAE.

Schefflera simplicifolia Merr. in Philip. Journ. Sci. **3** (1908) Bot. 159.

The Polillo collection, *9242*, somewhat closely matched by *Whitford 815*, from Tingnoan River, Tayabas, has distinctly wider leaves than the type, from Mindanao, but shows no other important difference.

Schefflera trifoliata Merr. & Rolfe in Philip. Journ. Sci. **2** (1907) Bot. 290.

Represented by *6958*, *10377*, *10428*; other distribution Laguna and Tayabas.

Other species: *Schefflera insularum* (Seem.) Harms, *6890*, *10371*.

UMBELLIFERAE.

Centella asiatica (Linn.) Urban, *6957*, local name *tacaip suso*.

ALANGIACEAE.

Alangium meyeri Merr., *10413*.

MYRSINACEAE.

Ardisia pirifolia Mez in Das Pflanzenreich **4** ^{236} (1902) 129; Merr. in Philip. Journ. Sci. **5** (1910) Bot. 217.

The type locality is Burdeos, on the east coast of Polillo. The species is extremely near *A. boissieri* A. DC., differing only by having the sepals or some of them emarginate. Trivial as the character seems, it holds for *9292*, collected on the opposite coast of the island from Burdeos, the only other provinces whence the form is known being Tayabas and Union.

Ardisia whitfordii Mez in Philip. Journ. Sci. **1** (1906) Suppl. 271.

Represented by *6792*, *10368*; other distribution Tayabas.

Discocalyx linearifolia Elmer Leafl. Philip. Bot. **2** (1908) 441.

Represented by *6834*; other distribution Tayabas, a very similar species with broader leaves ranging from Benguet to Cagayan.

Embelia porteana Mez in Das Pflanzenreich l. c. 302; Merr. in Philip. Journ. Sci. **5** (1910) Bot. 375.

Represented by *10411;* other distribution Mindoro, the type locality not known.

Other species: *Aegiceras corniculatum* (Linn.) Blanco, *6990, 10355; A. floridum* R. & S., *9088.*

SAPOTACEAE.

Mimusops elengi Linn., *6981.*

EBENACEAE.

Diospyros nitida Merr. in Bur. Govt. Lab. Publ. (Philip.) **35** (1906) 57.

This seems to be represented by *9214*, with staminate flowers, although the petioles are longer and the leaves wider than is usual in the species. Other distribution Benguet to Bataan and Rizal, Mindoro, Guimaras, Mindanao.

Other species: *Diospyros maritima* Blume, *9138, 10388*, local name *canumai: D. discolor* Willd. is also native on the island, although it was not collected; fruit was brought me on several occasions.

OLEACEAE.

Jasminum macrocarpum Merr. in Philip. Journ. Sci. **3** (1908) Bot. 258.

Represented by *6972, 9308*, local name *tinta europa:* other distribution Bataan and Rizal.

Other species: *Linociera cumingiana* Vidal, *10388.*

LOGANIACEAE.

Fagraea auriculata Jack in Mal. Misc. 2^{7} (1822) 82.

Represented by *10430;* other distribution Cagayan, Laguna, Negros, Palawan, Malay Archipelago, Malay Peninsula, India.

Fagraea racemosa Jack ex Roxb. Fl. Ind. **2** (1824) 35.

Common on Polillo, *9040, 9183, 10320, For. Bur. 3214 Hagger*, local name *libacan;* other distribution Rizal, Laguna, Tayabas, Albay, Sorsogon, Leyte, Sibuyan, Cebu, Negros, Mindoro, Mindanao, Basilan, Malay Peninsula, Andaman Islands, Malay Archipelago, Australia.

APOCYNACEAE.

Tabernaemontana mucronata Merr. in Philip. Journ. Sci. **4** (1909) Bot. 318.

Represented by *6974*, local name *pandacaqui;* other distribution Tayabas and Guimaras.

Voacanga plumeriaefolia Elmer Leafl. Philip. Bot. **1** (1908) 333.

Almost certainly represented by *10395*, although the Polillo collection is not quite an exact match for the cotype. No flowers were obtained. The species, known otherwise from Tayabas only, has much the appearance of a *Tabernaemontana*, in the alliance of *T. sphaerocarpa* Blume.

Other species: *Allamanda cathartica* Linn., *9162, 10385*, local name *campanilla: Cerbera odollam* Gaertn., *6977, 10332*, local name *lipata: Lochnera rosea* (Linn.) Reichb., *6984, 10363*, local name *San Pedro: Voacanga globosa* (Blanco) Merr., *9127, 10358*, local name *bayag cambing.*

ASCLEPIADACEAE.

Cynanchum schlechterianum Warb. in Perk. Fragm. Fl. Philip. (1904) 121.

Fruiting material, *9231*, probably represents this species, otherwise known from Tayabas, the only apparent difference being shorter petioles.

Dischidia hirsuta (Blume) Decne. in DC. Prodr. 8 (1844) 632.

The Polillo collection, *10408*, agrees fairly well with material from Masbate, identified by Schlechter, but is less hirsute. The identifications in this genus are somewhat approximate only, as the rather scanty material is reserved for dissection by a specialist on the family.

Dischidia oiantha Schltr. in Perk. Fragm. Fl. Philip. (1904) 127.

Probably represented by *9240*; type locality Cagayan, apparently a species of fairly wide Philippine distribution.

Dischidia platyphylla Schltr. in Philip. Journ. Sci. 1 (1906) Suppl. 300.

Probably represented by *10337*; type from Mindanao.

Dischidia sp.

A species with great general resemblance to the last but with different flowers is represented by *9244*, well matched by *Merrill 5219*, from Borongan, Samar. It is possibly the same as a named but undescribed species from Mindanao, our specimen of which has no flowers.

Hoya incrassata Warb. in Perk. Fragm. Fl. Philip. (1904) 130.

Represented by *10336*; other distribution Rizal, Tayabas, Mindoro, Mindanao.

Hoya merrillii Schltr. in Perk. Fragm. Fl. Philip. (1904) 131.

Represented by *9013*, *10431*; other distribution Tayabas, Bohol, Mindoro, Mindanao.

Other species: *Asclepias curassavica* Linn., *9051*, *10378*: *Centrostemma multiflorum* (Blume) Decne., *6975*, *10362*.

CONVOLVULACEAE.

This family was represented by very few species, the only two collected being *Ipomoea pes-caprae* (Linn.) DC., *6963*, and *Merremia hastata* Hallier f., *9153*; one other was seen.

BORAGINACEAE.

Cordia subcordata Lam. Ill. 1 (1794) 421.

Represented by *10351*; other distribution Tayabas, Camarines, Batangas, Burias, Mindoro, Palawan, Mindanao, Basilan, East Africa, Madagascar, southern Asia, Malaya, to Australia and Hawaii.

Other species: *Tournefortia sarmentosa* Blume, *9212*.

VERBENACEAE.

Callicarpa subalbida Elmer Leafl. Philip. Bot. 1 (1908) 337.

Represented by *6861*, *10269*; otherwise known only from Tayabas.

Clerodendron minahassae Teijsm. & Binnend. in Tijdschr. Ned. Ind. 25 (1863) 400.

C. blancoi Naves in Blanco Fl. Filip. ed. 3 (1877) *pl. 223*, non *C. blancoanum* F.-Vill. Noviss. App. (1880) 161.

Comparison of Naves' plate with that of *C. minahassae* in Miquel, Ann. Mus. Lugd.-Bat. 3: *pl. 9*, and with the series of Philippine collections of the species, fails to disclose any character by which this Philippine material can be held distinct from that from Celebes. The latter is figured as having a longer corolla than is usually seen on our collections, but it varies in length on the same branch, merely as a matter of age. The species is widely distributed in the Philippines, the Polillo numbers being *9057* and *10267*.

Other species: *Avicennia officinalis* Linn., *9060: Callicarpa formosana* Rolfe, *6959: Clerodendron brachyanthum* Schauer, *9271; C. commersonii* (Poir.) Spr., *9172, 10271; C. intermedium* Cham. & Schl., *10771: Premna integrifolia* Linn. f., *6871, 10268*, local name *alagao: Vitex negundo* Linn., *10270; V. trifolia* Linn. f., *9150*.

LABIATAE.

Dysophylla auricularia Blume Bijdr. (1826) 826.

Represented by *9014;* other distribution Nueva Vizcaya, Bohol, Culion, Mindanao, Malay Archipelago and Peninsula, India.

Other species: *Hyptis capitata* Jacq., *9016, 10404; H. suaveolens* Poir., *9154*, local name *suubcabuyo: Leucas lavandulifolia* Sm., *9015: Ocimum sanctum* Linn., *9182*, local name *locoloco*.

SOLANACEAE.

Capsicum frutescens Linn., *9227: Solanum cumingii* Dunal, *9151*, local name *talongtalungan; S. nigrum* Linn., *9164*.

SCROPHULARIACEAE.

Limnophila serrata Gaudich. in Freyc. Voy. Bot. (1826) 448, *pl. 57, fig. 2.*

Represented by *9025;* not previously known from the Philippines; other distribution Mariannes, Polynesia.

Russelia juncea Zucc. in Flora 15^{2} (1832) Beibl. 99.

This Mexican species is now thoroughly established on the walls of the town of Polillo, where it was not seen in cultivation, as well as in a few other Philippine localities; *9018, 10434*.

Vandellia scabra Benth. Scroph. Ind. (1835) 36.

The species so-called in Philippine botany is represented by *6916, 10397*, but the identification is doubtful in two ways. From the synonymy attributed to the species, there seem to be older valid specific names, one of them, *Torenia hirta* Cham. & Schl., having been based upon Philippine material. Moreover, in the Polillo specimens and nearly all others from the Philippines that have been so identified, the calyx is definitely, if but little, longer than the capsule. A study of the types may show that two species have been included under the one specific name.

Other species: *Bonnaya veronicaefolia* (Retz.) Spr., *s. n.: Limnophila gratissima* Blume, *9032: Scoparia dulcis* Linn., *9008, 9155, 10348*, local name *ualisualisan: Stachytarpheta indica* (Linn.) DC., *9049: Torenia polygonoides* Benth., *6912: Vandellia crustacea* (Linn.) Benth., *6913; V. cordifolia* (Colsm.) G. Don (*V. pedunculata* Benth.), *10398*.

BIGNONIACEAE.

Nyctocalos cuspidatum (Blume) Miq. in Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 249.

Represented by *10396;* other distribution Rizal, Batangas, Palawan, Basilan, Mindanao, Celebes, Moluccas.

Other species: *Radermachera pinnata* (Blanco) Seem., *10372*.

GESNERIACEAE.

Two species were collected, and are in the hands of a specialist for determination, a *Cyrtandra, 10257*, and a *Trichosporum, 6862.*

ACANTHACEAE.

Hemigraphis strigosa (Nees) F.-Vill. Noviss. App. (1880) 153.

This, or an extremely close ally is represented by *6995*, the distribution of the species, with the same qualification, being Bontoc, Laguna, Masbate, Negros, Mindoro, Mindanao.

Staurogyne debilis (Anders.) C. B. Clarke ex Merr. in Philip. Journ. Sci. 2 (1907) Bot. 302.

Represented by *9003;* other distribution Cagayan, Benguet, Tayabas, Rizal, Negros, Mindoro, Mindanao.

Other species: *Acanthus ilicifolius* Linn., *6961: Blechum brownei* A. Juss., *9147: Eranthemum curtatum* C. B. Clarke, *9196: Hygrophila angustifolia* R. Br., *9217.*

RUBIACEAE.

Hedyotis philippensis (Willd.) Merr. in herb. comb. nov.

Spermacoce (?) *philippensis* Willd. ex Spr. Syst. 1 (1825) 401.

S. philippinensis F.-Vill. Noviss. App. (1880) 113.

Metabolos laevigatus (Bartl.) DC. Prodr. 4 (1830) 436.

Sclerococcus laevigatus Bartl. in herb. Haenke ex DC. l. c.

Hedyotis laevigata Miq. Fl. Ind. Bat. 2 (1856) 178.

Spermacoce meyeniana Walp. in Nov. Act. Acad. Nat. Cur. 19 (1843) Suppl. 1: 353.

Hedyotis congesta Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 127, non R. Br. ex G. Don Gen. Syst. 3 (1834) 525.

Willdenow's and Bartling's types are extant: of the former we possess a carbon impression, of the latter fragments, both secured by Mr. Merrill, who was further able to compare them with more recent collections. Both were obtained by the same expedition, almost certainly by the same collector, and it is highly probable that they are parts of a single collection. Of Meyen's type, we also have a carbon impression, with notes, and it seems to differ only slightly from the older species, and then in pubescence. Taken in conjunction with numerous recent collections, including *6832*, from Polillo, it does not seem possible to maintain it as a distinct species. The alliance is unquestionably with *H. congesta* R. Br., but it differs from the only Indian specimen of the latter which we possess, *Dr. Prain's collector 57*, Andaman Islands, by the thinner leaves with less conspicuous and more arched venation. It has a rather wide Philippine distribution.

Hydnophytum formicarum Jack in Trans. Linn. Soc. 14 (1823) 124.

Represented by *9084;* other distribution Tayabas, Mindoro, Mindanao, Borneo, Java, Sumatra, Andaman Islands, Malay Peninsula. It may be worth adding that although the stem-bases were of large size and characteristically excavated, the few ants within were most peaceably disposed.

Ixora inaequifolia sp. nov.

Ixorae auriculatae Elmer affinis, sed differt stipulis brevioribus et foliis heterophyllis, oppositis similibus sed parium differentium valde inaequimagnis, aliis oblanceolatis, 12 usque ad 20 cm longis, ceteris ellipticis, usque ad 3 cm longis.

Inflorescence terminal, corymbose, about 12 cm long, the peduncle nearly 8 cm long, then trifurcate, the secondary peduncles 15 to 18 mm long, again trifurcate, tertiary peduncles about 1 cm long, each bearing 3 flowers on pedicels usually 5 mm long or some slightly longer or much shorter; bracts paired at each fork of the inflorescence and at the base of the fruits, similar, narrowly triangular-lanceolate with a widened base, about 3 mm long, acute: calyx subpersistent, the tube about 1 mm long, the 4 lobes lanceolate, obtuse, 3 mm long; fruits 7 to 9 mm in diameter, pale-green flushed with red, 2-celled, each cell with 1 seed about 6 mm long, its testa bony.

A shrub, entirely glabrous except for the lepidote under surface of the leaves, the branchlets somewhat angled: leaves opposite, sessile, coriaceous, those of each pair similar but those of different pairs very dissimilar, one type oblanceolate or oblong-oblanceolate, 12 to 20 cm long, 3 to 5.5 cm wide, the base auricled, the apex abruptly contracted into an acumen not over 5 mm long, the other type elliptic, 23 to 30 mm long, 12 to 13 mm wide, the base round, the apex acuminate as in the larger type; primary lateral veins of each side of larger leaves 15 to 20, with intermediate veins often nearly as prominent, the finer reticulation lax, the veins of the smaller leaves rather fewer and much closer; internodes between the smaller leaves and the larger ones next below much shorter than between the smaller ones and the larger next above; stipules interpetiolar, about 4.5 mm long, the nearly semicircular base about twice as long as the slender acumen.

POLILLO, in forest, *Bur. Sci. 10216 McGregor*. The species has much similarity to *I. auriculata* Elmer, but differs very strikingly by the presence of the smaller leaves, the larger ones also having a somewhat different outline, while the stipules are much shorter and more shortly acuminate. It is also similar, but less so, to *I. philippinensis* Merr.

Ixora macgregorii sp. nov.

Frutex: inflorescentiis terminalibus, paniculato-corymbosis, floribus bibracteolatis; calycis tubo et lobis subaequilongis; corollae tubo subcylindrico, lobis late lanceolatis, acutis, revolutis; filamentis crassis, antheris linearibus, sagittatis: foliis submembranaceis, lanceolatis vel oblongo-lanceolatis, basi rotundatis sed ima basi acutis, apice acuminatis.

Panicles terminal, subcorymbose, the peduncle 3 to 4 cm long, its branches opposite, the lowest about 8 mm long, decreasing in length toward the apex of the inflorescence, the secondary branches about 5 mm long, bearing sessile or pedicelled flowers and usually an additional peduncle with one or two flowers at its apex; peduncle glabrous, the further divisions increasingly puberulent; bracts linear-lanceolate, acute, decreasing in length from 8 mm at the base of the peduncle to 1 mm at the base of the pedicels; each flower subtended at the base by

2 lanceolate bracteoles 1.2 to 1.5 mm long, acute or acuminate at the apex: calyx in all 2.2 to 2.5 mm long, sometimes the tube but more often the lobes slightly the longer, the lobes 4, ovate, acuminate; corolla white, the tube about 16 mm long, less than 1 mm in diameter at the base, nearly 1.4 mm in diameter at the base of the lobes, the latter 4, broadly lanceolate, acute, 7 mm long, 3 mm wide at the base, revolute; filaments stout, 2.5 mm long; anthers 5.5 mm long, linear, the cells produced separately at the base for 2 mm below their insertion; style 2 cm long, the stigmatic arms about 2 mm long: fruit red, subglobose, 7 mm long in addition to the subpersistent calyx-lobes, 8 to 9 mm in diameter, 2-celled, each cell with 1 plano-convex seed about 5.5 mm long, peltately attached, or one cell sometimes aborting.

A bush, its vegetative parts entirely glabrous, the ultimate branches quadrangular, dark-colored, the next older paler: leaves with grooved petioles 4 to 8 mm long, the submembranaceous lamina lanceolate or oblong-lanceolate, 14 to 23 cm long, 4 to 7 cm wide, the base rounded or somewhat abruptly narrowed, very shortly acutely acuminate, the apex forming an obtuse but at least sometimes mucronate acumen 1 to 1.5 cm long; primary veins on each side of the midrib 18 to 25, slightly projecting or immersed, even on the same leaves, nearly straight or toward the margin well arched.

POLILLO, *Bur. Sci. 10219 McGregor* (type). LUZON, Province of Albay, *Cuming 896*, the specimen here rather fragmentary and apparently with fewer leaf-veins, but otherwise very similar. Allied to *I. kingstoni* Hook. f., but distinguished by the leaf-bases, venation, shorter corolla, and otherwise.

Lasianthus copelandii Elmer Leafl. Philip. Bot. 1 (1906) 10.

Represented by *9187*; other distribution Laguna, Negros, Mindoro, Mindanao.

Myrmecodia sp.

A sterile specimen, *10224*, is well matched by *Whitford 817*, Tingnoan River, Tayabas, in a similar condition.

Nauclea media Hav. in Journ. Linn. Soc. Bot. 33 (1897) 56.

Represented by *9119*, *10215*; other distribution Rizal, Tayabas, Albay, Bataan, and Mindoro.

Ophiorrhiza involucrata Elmer Leafl. Philip. Bot. 1 (1908) 251.

Rather frequent on Polillo, *6833*; other distribution Tayabas.

Ophiorrhiza mungos Linn. Sp. Pl. (1753) 150.

Represented by *9233*; other distribution Batanes, Babuyanes, Isabela, Benguet, Tayabas, Laguna, Mindanao, Java, Sumatra, Malay Peninsula, India, Ceylon.

Psychotria banahaensis Elmer Leafl. Philip. Bot. 1 (1906) 26.

Well matched by *6842*; known also from Tayabas and Negros, with closely allied forms in other provinces. Very similar, also, are three Polillo collections, *6835*, *10212*, *10775*, but the venation of the broader leaves is coarser; all are fruiting, and when flowering material is secured, they may prove to belong to an undescribed species.

Psychotria longipedunculata Elmer Leafl. Philip. Bot. 3 (1911) 1027.
Represented by *10218;* otherwise known only from Sibuyan.

Psychotria pinnatinervia Elmer Leafl. Philip. Bot. 1 (1906) 26.
Represented by *9295;* other distribution Tayabas, Laguna, with at least closely allied forms in Rizal.

Sarcocephalus pubescens sp. nov.

Arbuscula: inflorescentiis axillaribus terminalibusque, solitariis, binis, vel ternis, bracteis varie positis; novellis, petiolis, stipulis, subtus foliis inflorescentiisque hirsutis; foliis oppositis, ellipticis vel elliptico-obovatis, basi acutis, apice acuminatis; stipulis interpetiolaribus, late oblanceolatis, deciduis.

Inflorescences solitary, paired, or in threes, axillary or terminal, the peduncles 1.5 to 3 cm long, hirsute especially below the bracts and at the apex; bracts not inserted within 3 mm of the base or of the apex of the peduncle, but anywhere between, lanceolate to ovate, obtuse or shortly acuminate, 4 to 9 mm long, hirsute: heads excluding styles 1.5 to 2 cm in diameter, the united ovaries alone 4 to 8 mm in diameter; calyx-lobes about 5, yellow, 1.5 mm long, thickened and flattened at the apex, deciduous; corolla white, tubular, the tube glabrous, 4.5 to 5 mm long, the 4 ovate lobes about 1 mm long, rounded or truncate; stamens 4, the filaments 0.3 mm long, inserted at the sinuses of the corolla-lobes, the anthers ovate, nearly 1 mm long, almost entirely exserted; style about 9 mm long, the fusiform stigma 1 mm long; ovary 2-celled.

A tree attaining a height of 6 m, with a trunk 8 cm in diameter, the bark of the terete branches grayish-brown, the youngest shoots purplish when dry, and together with the stipules, petioles, and the under surface of the leaves fuscous-hirsute: leaves opposite, the petioles 6 to 12 mm long, the lamina submembranaceous, brownish when dry, elliptic or elliptic-obovate, 5 to 9.5 cm long, 2.5 to 5.5 cm wide, or some still smaller, the base usually rounded but meeting the petiole acutely, the apex abruptly contracted into a slender obtuse acumen 6 to 12 mm long; lateral veins 7 or 8, reddish, the secondary veins numerous and fairly conspicuous; stipules interpetiolar, broadly oblanceolate, 15 to 20 mm long, rounded at the apex, deciduous.

POLILLO, in a meadow about 2 km east of the town, at about 10 m elevation, *Bur. Sci. 6917 Robinson* (type). SAMAR, San Juan, *For. Bur. 12882 Rosenbluth,* local name *malbog,* the wood used for tables; plant in late flower, with somewhat longer and thicker leaves, but otherwise very similar. The species is allied to *S. junghuhnii* Miq., but is separable by the pubescence, shape of the leaves and stipules, and other less conspicuous characters. A still more natural alliance may be with *S. hirsutus* Hav., of Borneo, which seems to have shorter and differently shaped stipules, larger and thinner leaves, and larger heads of flowers.

Tetralopha (?) polillensis sp. nov.

Suffrutex, ramis pendulis: inflorescentiis axillaribus, bracteatis; calyce urceolato, truncato vel subtruncato, ciliolato; corolla aestivatione valvata, sub anthesi plus minusve alte divisa, lobis 4, lanceolatis, recurvis, intus dense lanatis; staminibus 4; ovario biloculari, 2-ovulato: foliis petiolatis, lanceolatis vel elliptico-lanceolatis, nigricantibus, basi acutis, apice acuminatis.

Inflorescences axillary, rarely also terminal, excluding the flowers 1 cm long or more often distinctly shorter, the flowers in one to three superimposed whorls with or without a basal peduncle, the internodes, when any, 2 to 3 mm long; the nodes involucrate by ovate, acuminate, ciliate, united bracts, sometimes also with bracts similar to the leaves but much smaller; pedicels stout, 1 mm long, or almost wanting: calyx urceolate, 2.5 to 3 mm long, 2.5 mm in diameter at the rim, the rim extending beyond the ovary, truncate or very obscurely 2- or 4-lobed, ciliolate; corolla white, in all 13 to 14 mm long, valvate in bud, at anthesis splitting about half-way to the base, the 4 lobes lanceolate, obtuse, recurved, their inner surfaces densely white-lanate to below the insertion of the stamens; filaments inserted upon the corolla about 5 mm from its base, about 2 mm long, the linear-lanceolate anthers 2.5 mm long, their tips slightly exserted; disk pulvinate, with 2 sessile stigmas 0.3 to 0.5 mm long; ovary at least sometimes 2-celled with 2 collateral ovules in each cell, sometimes showing traces of 4 cells.

A shrub 3 m high, its branches pendent (from herbarium material would be considered scandent), the branches 4-angled or nearly terete, covered with gray or yellowish-gray bark, vegetative parts entirely glabrous: leaves opposite, the petioles 8 to 15 mm long, the lamina subcoriaceous, blackish when dry, lanceolate or in smaller leaves elliptic-lanceolate, 6.5 to 13.5 cm long, 1 to 5 cm wide, narrowed to both ends, the base acute, the apex forming an obtuse or subacute acumen 5 to 10 mm long; lateral veins 7 to 9, the secondary reticulations prominent, especially on the under surface; stipules ovate, obtuse, 1 mm long, connected by a stipular line.

POLILLO, beside a clearing about 1.5 km south of the town, *Bur. Sci. 9064 Robinson*. The generic difficulties are connected with the nature of the ovary, mechanically as to its actual structure, but also as to whether it is typical of the species or rather a reduced state belonging to the staminate flower of a diclinous form. Externally, it is perfectly represented in the figure of *Tetralopha motleyi*[5] Hook. f., internally, it seems to vary, usually having the 2-celled, 2-ovuled condition of that species, but sometimes appearing to be 4-celled. The ovules were quite immature. In other words, the species might with almost equal propriety be placed in *Gynochthodes*. A Negros plant is closely allied and is here also described. The remaining Philippine species is *T. philippinensis* Elmer, from Sibuyan.

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[5] Hook. Ic. Pl. *pl. 1072.*

Tetralopha (?) lenticellata sp. nov.

Tetralophae polillensi valde affinis, sed ramis nigris conspicue lenticellatis, floribus brevioribus, filamentis inferius insertis distinguenda.

Flowers umbellately inserted, the peduncle more slender than in *T. polillensis*, 7 to 12 mm long, the pedicels also more slender, 1.5 to 3 mm long; calyx 1.5 to 2 mm long, corolla 9 to 10 mm long; filaments inserted about 2 mm from the base of the corolla, 3 mm long, anthers 2 mm long.

Habit probably the same as in *T. polillensis*, but the bark of the branches blackish, conspicuously marked by white lenticels: petioles 7 to 17 mm long, lamina merely chartaceous, varying from oblanceolate through elliptic to lanceolate, 9 to 13 cm long, 3 to 5 cm wide, the apical acumen narrower and more acute. Otherwise as in *T. polillensis*.

NEGROS, near Cadiz, *For. Bur. 13689 Curran.*

Uncaria philippinensis Elmer Leafl. Philip. Bot. 1 (1906) 38.

Very common on Polillo, *9122;* other distribution Tayabas, Mindoro, Mindanao, Balabac. A young shoot, *10223*, belongs to this genus, but is not further determinable.

Urophyllum arboreum (Reinw.) Korth. Ned. Kruidk. 2^{5} (1851) 194.

Wallichia arborea Reinw. ex Blume Cat. Gew. Buitenz. (1823) 11.

Urophyllum glabrum Jack ex Roxb. Fl. Ind. ed. Carey & Wall. 2 (1824) 186.

Represented by *9197, 10210;* other distribution Laguna, Tayabas, Camarines, Negros, Mindoro, Mindanao, Borneo, Java, Malay Peninsula.

Urophyllum lucbanense Elmer Leafl. Philip. Bot. 1 (1906) 72.

Represented by *6940, 10211;* other distribution Tayabas.

Xanthophytum fruticulosum Reinw. ex Blume Bijdr. (1826) 839; Merr. in Philip. Journ. Sci. 4 (1909) Bot. 328.

Apparently rare on Polillo, only one plant seen, on low hills near San Francisco, *9004*. Of the three previous Philippine collections, one is from Rizal, one from eastern Laguna, the locality of the other, not definitely known, was more probably southeastern Luzon. Other distribution Borneo, Java.

Other species: *Argostemma solaniflorum* Elmer, *9193: Ixora macrophylla* Bartl., *6844, 10213: Morinda bracteata* Roxb., *6951*, local name *bancoro: Mussaenda philippica* A. Rich., *6874, 6991*, local name *taligharop: Oldenlandia corymbosa* Linn., *10222; O. paniculata* Linn., *9167, 10217: Ophiorrhiza oblongifolia* DC., *9007: Paederia tomentosa* Blume, *9180, 10214: Pavetta barnesii* Elmer, *6993, 10220: Plectronia umbellata* (Bartl.) K. Sch., *6976, 6992: Psychotria sarmentosa* Blume, *9056, 10221: Scyphiphora hydrophyllacea* Gaertn., *9141.*

CUCURBITACEAE.

Melothria indica Lour., *6924; M. mucronata* (Blume) Cogn., *6931, 10432: Momordica charantia* Linn., *9174.*

CAMPANULACEAE.

Pentaphragma philippinense Merr. in Philip. Journ. Sci. 2 (1907) Bot. 308.

Represented by *6936, 10393;* other distribution Cagayan, Tayabas, Albay, Sorsogon, Mindoro, Mindanao; conspicuous in ravines along the eastern coast of Luzon.

GOODENIACEAE.

Scaevola koenigii Vahl, *6950.*

COMPOSITAE.

Bidens pilosa Linn., *9177: Cosmos sulphureus* HBK., *10374: Elephantopus mollis* HBK., *9055: Emilia sonchifolia* (Linn.) DC., *9166: Erigeron linifolius* Willd., *6954: Synedrella nodiflora* (Linn.) Gaertn., *9176: Vernonia cinerea* (Linn.) Less., *6900, 9156; V. patula* (Ait.) Merr., *9149, 10405: Wedelia biflora* (Linn.) DC., *6965.*

THE PHILIPPINE

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C. BOTANY

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THE PALMS OF THE ISLAND OF POLILLO.[1]

By O. BECCARI.

(Florence, Italy.)

Areca Catechu Linn. var. **longicarpa** Becc. var. nov.

Fructibus luteis, elongato-ellipsoideis, 5.5 ad 7 cm longis (una cum perianthio) 2.5 ad 3 cm crassis, pericarpio in fere dimidia inferiori parte pleno, semine e basi plana late conoideo, obtuso, 22 mm crasso, 24 mm longo.

Bur. Sci. 10470 McGregor.

Areca Ipot Becc. var. **polillensis** Becc. var. nov.

A forma typica differt caudice graciliori, 4 m longo, 4 ad 5 cm diam., spadicibus brevioribus. Specimina incompleta, fructibus immaturis, tantum vidi. An species distincta?

Bur. Sci. 6938 Robinson, along stream, altitude 25 m; *Bur. Sci. 10468, 10469 McGregor.*

Pinanga Barnesii Becc. in Webbia 1 (1905) 320.

Bur. Sci. 10466 McGregor, Bur. Sci. 6937 Robinson.

Arenga saccharifera Labill.

Bur. Sci. 9041 Robinson, vernacular name (Tagalog) *bunga ñg cauang; Bur. Sci. 10468 McGregor.*

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[1] This paper was received just too late for publication with the other articles on the phanerogams of Polillo. The Island is situated off the east coast of Luzon, almost in the latitude of Manila. The collections here identified were made by R. C. McGregor and C. B. Robinson, both of the Bureau of Science, by the latter in the month of August, 1909, by the former in the succeeding three months.—ED.

Nipa fruticans Thunb.

Bur. Sci. 10462 McGregor; Bur. Sci. 9061 Robinson, vernacular name (Tagalog) *sasa*.

Oncosperma horridum (Griff.) Scheff.

Bur. Sci. 9277 Robinson, vernacular name (Tagalog) *anibong*. In hill forests, altitude 75 m.

Livistona Robinsoniana Becc. sp. nov.

Elata, caudice 12 m et ultra longo, 20 cm diametro. Frondium petiolus in parte apicali inermis, lamina in parte centrali circiter 80 cm longa, regulariter multifida, segmentis intermediis circiter ad medium liberis, apice breviter bifidis, laciniis acuminatis rigidis 12 ad 15 cm longis. Spadices elongati, spathis tubulosis arcte vaginati; inflorescentiis partialibus 2–3-furcatis, paniculaeformibus, 25 ad 30 cm longis, florum pulvinulis superficialibus, unifloris. Flores minutissimi, sessiles. Perianthium fructiferum depressum, circiter 3 mm diametro. Fructus sphaerici, 16 ad 17 mm diametro, a processu raphidis cylindraceo sinuoso transfossum.

Livistonae rotundifoliae ut videtur proxima, differt fructibus aurantiacis, nec nigrescentibus, et lamina profundius partita.

Bur. Sci. 9265 Robinson, vernacular name (Tagalog) *pilig*, edge of forest, altitude 5 m, rather common locally, 12 m or more in height, 20 cm in diameter, fruit orange, petiole about 1 m long; *Bur. Sci. 10471 McGregor*.

Calamus microcarpus Becc. in Records Bot. Surv. India 2 (1902) 213, Philip. Journ. Sci. 4 (1909) Bot. 627.

Bur. Sci. 9131 Robinson, altitude 5 m, in thin forests, vernacular name (Tagalog) *bunga ñg sipay; Bur. Sci. 10465 McGregor*.

Calamus ornatus Blume var. **philippinensis** Becc. in Webbia 1 (1905) 346.

Bur. Sci. 9266 Robinson, along streams, edge of rice fields, 7 m high, 6 cm in diameter, vernacular name *limoran; Bur. Sci. 10461 McGregor*, in low forests along streams, altitude about 10 m, fruit green, turning yellow, eaten by natives, sour and somewhat bitter.

Calamus filispadix Becc. nom. nov.

Calamus Hookerianus Becc. in Philip. Journ. Sci. 5 (1909) 621, non in Ann. Bot. Gard. Calcutta 11 (1908) 226, *t. 70.*

Bur. Sci. 10467 McGregor.

I now consider the Philippine plant which I previously had referred to *C. Hookerianus*, to belong to a distinct species. Specimens of true *Calamus Hookerianus* have recently been collected by Mr. A. Meebold in the forests of Kandy, Ceylon; there is, therefore, no ground to doubt that the type specimens of the species had not really been collected in Courtallum, as several species of plants growing in Ceylon are also found in southern India.

Calamus Diepenhorstii Miq. var. **exulans** Becc. in Philip. Journ. Sci. 5 (1909) Bot. 627.

Bur. Sci. 9111 Robinson, on Mount Malulud, altitude 100 m.

Daemonorops ochrolepis Becc. in Perkins Frag. Fl. Philip. (1904) 47.

Bur. Sci. 9039 Robinson.

THE PHILIPPINE JOURNAL OF SCIENCE, C. BOTANY.
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PHILIPPINE DIPTEROCARPACEAE.

By FRED W. FOXWORTHY.

(From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.)

There is surprisingly little known of this family, although it produces our most important timber trees and certain species form the bulk of the stand in our primitive forests. The time of flowering and fruiting is not well understood for any of our species. The reasons for this are probably the scanty population and the primitive state of the natives where the members of this family are most common, and the very large size of the trees. Most of the species produce trees of very large size, which are unbranched to a considerable height. This makes it very difficult to collect herbarium material and also difficult to determine whether the trees are in flower or fruit. Moreover, these trees are often found in regions remote from transportation, the species are variable and closely related. Other regions of the tropical east where this family is represented, present similar conditions; so, there is not so much aid in the consideration of critical points as might be desired.

The published data on the Philippine dipterocarps has consisted of very incomplete and inaccurate descriptions of some ten or eleven species by Blanco;[1] the splendid work of Dr. Whitford [2] on the composition and stand of the dipterocarp forests, with habit notes on many species; descriptions of a number of species by Brandis;[3] and scattered taxonomic notes on particular species by various workers. In addition to these, there are a number of notes on habit, distribution, etc., that have been made by various members of the forest service in the Philippines, and which include much of the most valuable work that has been done. In my work on this group, I have been aided principally by material and observations furnished me by Mr. H. M. Curran, Dr. H. N. Whitford, and other members of the Bureau of Forestry. I am also indebted to Dr. H. Hallier and the late Dr. W. Burck for help in comparing herbarium material in the Rijks-Herbarium at Leyden and to Mr. C. H. Wright for placing at my disposal material in the herbarium at Kew. Mr. H. N. Ridley, Director of the Botanic Gardens at Singapore, and Dr. Joh. Schmidt have also aided me with literature. Dr. A. F. G. Kerr, of Chieng Mai, has kindly supplied me with comparative material from Siam and Dr. J. C. Willis with material from Ceylon. Government officials in Sarawak and British North Borneo have aided me a great deal in my collecting in those countries.

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[1] Blanco, M. Flora de Filipinas (1837) 401, 446–454; ed. 2 (1845) 281, 310–315.

[2] Whitford, H. N. Studies in the Vegetation of the Philippines. I. The Composition and Volume of the Dipterocarp Forests of the Philippines. This Journal 4 (1910) Bot. 699–725; The Forests of the Philippines. Bull. Philip. Bur. For. 10 (1911).

[3] Brandis, Dietrich. An Enumeration of the Dipterocarpaceae. Journ. Linn. Soc. Bot. 31 (1895) 1–148.

FAMILY CHARACTERISTICS.

Trees, usually of large size, with tall stems, often unbranched to a considerable height. Leaves evergreen, simple, alternate, stipulate, penninerved; stipules often small and early deciduous. Wood, pith, bark, and leaves usually containing resin-canals. Fruits with sepals prolonged into wings, which often exceed the fruit in length and aid in its dispersal. Flowers perfect, numerous, in panicles, usually 5-merous. Receptacle obconical, sometimes concave. Sepals 5. Stamens ∞, 15, 10, or 5. Carpels (3–1) with each of the 2 anatropous ovules with 2 integuments. Stylopodium often present. Style short or long, glabrous. Stamens of various form; filaments often connate; anthers with the connective often prolonged. Only one of the ovules develops into a perfect seed. Cotyledons with long petioles; radicle superior; hypocotyl often as long as the embryo. Cotyledons usually bifid to the base and often divided into numerous lobes. Seeds often albuminous.

SPECIAL MORPHOLOGY AND EMBRYOLOGY.

Little or nothing has been done in the study of any of our species. The only observations have been such as could be made from the study of unripe fruit and from newly sprouted seedlings.

ANATOMY.

Resin-canals.—The first conspicuous feature is the presence of resin-canals in various parts of the plant. They occur in the pith and wood of all species and in the leaves and bark of most. These canals are often of a form similar to those found in coniferous woods. In many species they are found filled with a hardened whitish resin in the old wood. In *Dipterocarpus* and *Anisoptera* they are often found to be filled with a viscid wood oil which is said to be fluorescent.

Pith.—The pith is heterogenous, the greater part of it being made up of thin-walled cells. In some cases, mucilaginous cells are found. Resin-canals occur either in the center or the periphery of the pith. Their number and arrangement has some value as a taxonomic character.

Wood.—The wood is characterized by the presence of resin-canals and, frequently, a large amount of wood parenchyma. The resin-canals do not seem to show any very regular arrangement. In some forms (species of *Pentacme*, *Shorea*, *Hopea*, *Parashorea*), they are abundant and form noticeable whitish rows, which are incompletely concentric and occur at irregular intervals. They present a whitish appearance, because of the contained resin, and give an appearance like that of seasonal growth rings. In some cases (species of *Anisoptera* and *Dipterocarpus*), the resin-canals are filled with oil, which causes them to be less readily distinguished. In these cases, the oil flows out and covers the stump when the tree is cut, making the stump and the butt of the log very gummy.

In *Vatica* wood, the resin-canals are much less prominent than in those forms already mentioned. The wood elements are rather finer and very regular in arrangement.

The color of the wood of *Vatica* and the species of *Shorea* and *Hopea* which are known as *yacal* or *dalindingan*, is a yellow-brown when first cut, becoming much darker on exposure to the air.

Many species of *Shorea* (*S. polysperma*, *S. teysmanniana*, *S. negrosensis*, etc.) have wood of a fine clear red color. *S. squamata*, *S. eximia* and *Parashorea plicata* have wood which is much lighter in color, but which may occur darker or which may darken to the color of *S. polysperma*. It is most often, however, of the same color as the sapwood of that species. *Pentacme contorta* has wood of a dull-gray or faint-brownish color. Some Shoreas (*S. guiso*, etc.) have hard, fine-grained, light grayish or reddish wood, with a very abundant development of wood-parenchyma.

In all reddish dipterocarp woods the color fades badly on prolonged exposure to the air.

Some species of *Anisoptera* and, possibly, some Shoreas, which have a pale-yellow wood, show a pale-rose tint in the freshly cut wood.

In hardness, the wood is very variable, ranging all the way from the very soft wood of *Pentacme* and some of the Shoreas, to the very hard wood of some of the Hopeas, Shoreas, and Vaticas. The hardness of these latter seems to be due principally to the thick cell-walls.

The following statements concerning the minute anatomy of the wood are taken from Solereder:[4] "The cross-section of the wood shows roundlumened, mostly isolated vessels of various diameters (0.07–0.105 mm) and broader 3–5-rowed pith-rays. The vessels have simple pits and on the walls in contact with pith-ray parenchyma, a transition from typical bordered to simple pitting. The wood parenchyma is richly developed. The wood prosenchyma in *Shorea* and *Hopea* has only very small, often indistinct, bordered pits; typical bordered pitting is shown on the contrary in *Dipterocarpus* and *Vatica*. According to Brandis and Gilg, the pitting in the genus *Dipterocarpus* is not constant. According to Brandis, diaphragming of the wood prosenchyma occurs in *Pentacme*. In the older wood, the same substances as are contained in the resin-canals, are also present in the pith-rays, in the vessels and in the wood-parenchyma."

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[4] Solereder, H. Systematische Anatomie der Dicotyledonen (1899) 157.

Bark.—The bark of most, and perhaps of all, species shows the pyramidal arrangement of bast so well known in *Tilia*. Vascular bundles, resin-canals, and mucilage-cells are present in the bark of some species.

Leaves.—The leaves are often coriaceous and contain resin-canals. Usually entire, sometimes with serrate or dentate margins. The leaves of seedlings are usually much more membranaceous than are those of mature trees and are usually of much larger size. Venation[6] simply pinnate. Secondary nerves often parallel. Tertiary nerves sometimes clothed with stellate hairs, and the space between them also sometimes clothed with simple, stellate or peltate hairs or scales.

Domatia are present in *Hopea basilanica, H. mindanensis, H. philippinensis, H. plagata, H. pierrei, H. ovalifolia, Shorea teysmanniana, S. squamata* and other species. The exact structure and function of these domatia is not well understood.

Stomata are said to be found only on the under side of the leaf.

The petioles are usually thickened for a part of their length and contain a number of vascular bundles and resin-canals, the arrangement of which is of some systematic importance.

The stipules are often of small size and early deciduous. They are usually most prominent on seedlings. The twig is completely encircled by the stipule-scar in *Parashorea* and *Dipterocarpus*.

BIOLOGICAL FEATURES.

Brandis, *l. c.* 6, has called attention to the frequently gregarious habit of this family, and has compared the *Dipterocarpaceae,* in this respect, to the conifers of the temperate regions. A few of the Philippine species, notably *Vatica* spp., do not seem to have this peculiarity to any great extent. Dr. Whitford[6] has shown that the dipterocarps in the Philippines frequently form almost solid stands over considerable areas. These stands are made up of several species.

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[6] Throughout this paper, I have followed Brandis, *l. c.* in the use of terms referring to the venation. The midrib is considered as the primary nerve, the first branches from it, the secondary nerves, etc. Nerve and vein are used as synonymous.

The trees are usually of large size, erect and comparatively free from prop-roots; although *Pentacme*, *Anisoptera* and some others do occasionally form fair-sized low prop-roots.

Time of flowering and fruiting.—It is because of our ignorance of this that our knowledge of the generic position of some species is so vague. The great size of many of the trees makes it a difficult matter to collect herbarium material from them. They stand out above the others in the forest and are much less likely to be covered with climbing vines. Much the most practicable method of collecting herbarium material, is by chopping the tree down. As the average collector is unwilling to take so much trouble, the material secured is often very fragmentary, and material picked up under the tree does not furnish the safest indication of the condition of the plant. An indication of the time of flowering or fruiting is obtained by the finding of flowers or fruits on the ground under the tree. Very often the only fruiting material we have of a particular species has been so found.

Indications seem to point to a very definite flowering season for some species and to a widely extended season for others. *Dipterocarpus grandiflorus* Blanco has been collected in flower in the months of January, February, March, April, May, June, and December; and in fruit in January, February, May, June, August, and September. The variable climatic conditions in different parts of the Islands are probably responsible for this. Even in the same section, as in Bataan, there is a good deal of variation, perhaps due to soil, exposure and moisture conditions. This species and a number of others seem to flower regularly every year. There are some species, as *Hopea plagata* (Blanco) Vid., which are reputed to flower only once in several years. I think it likely that most species flower, at least partially, each year.

When fruit is produced, it is found in great quantity; but, there seems to be a very low percentage of germination. The seeds lie on the surface of the ground and germinate quickly, if at all. They seem to require a fairly constant and uniform amount of moisture for germination and the seedlings die quickly if exposed to the hot sun. It seems that the seeds occasionally germinate while still on the tree. Certain species, as *Shorea eximia*, contain fatty material in the seeds, which are greedily eaten by wild pigs and other animals. Such seeds as these disappear very quickly, within a few days after falling.

Shortly after germination, the wings fall off and the thick, divided cotyledons are quickly raised on the long hypocotyl.

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[6] This Journal 4 (1910) Bot. 699–725.

The rate of growth is not known, but it is believed to be fairly rapid for some species.

So far as known, there are no Loranthaceous parasites on Philippine dipterocarps. The trees are usually comparatively free from climbing vines.

Old trees are frequently badly affected with a heart rot and are hollow at the center. In red lauan, (*Shorea negrosensis*) in Negros, there is a peculiar kind of heart rot which destroys a considerable amount of lumber and which is known as soft heart. The wood for some distance about the center of the log is very brash and will break with its own weight. It is not noticeably different in color from the rest of the heartwood. This seems to be caused by a species of fungus (*Pyropolyporus*). This soft heart is apparently succeeded by the hollow heart in the older trees.

Standing, healthy trees do not seem often to be attacked by insects, but fallen or diseased trees have a great many insect enemies. Seasoned wood of some species is badly attacked by beetles, the "pin-hole" and "shot-hole" borers.

Some forms of leaf- and stem-galls are common on certain species. Certain large galls are often mistaken for fruit in *Shorea guiso*, *S. teysmanniana*, and some other species.

DISTRIBUTION.

Fossil remains. We have an example of a piece of wood belonging to this family which was collected from a ledge in Cavite Province.

Brandis, in his "Enumeration," credited twenty-five species to the Philippines, five of these being considered extra-Philippine in distribution. We now recognize almost double the number of species in the Islands and about one-third of all our species are known to be extra-Philippine, while quite a number of others are so closely related to extra-Philippine species or are so little understood that it is altogether probable that we will find most of our species to be extra-Philippine when we come to understand them better.

It is apparent that our dipterocarps are most closely related to those of Borneo and the Malay Peninsula. This near relationship is much more significant than the mere number of species would indicate, because the species are so rich in individuals and constitute such an important part of the forest where they occur.

The extreme northeastern distribution of the family is found in the Philippines.

The following table is to show the distribution of the Philippine species so far as it is known:

TABLE I.—*Distribution of Philippine Dipterocarps.*

Species.	British India and Burma.	Siam and Cochin China.	Malay Peninsula.	Borneo.	Sumatra.	Java.	Celebes.	Bangka.	New Guinea.	
1. **Anisoptera brunnea**										
2. **A. curtisii**			×	×						
3. **A. thurifera**			×							
4. **A. sp.**										
1. **Dipterocarpus pilosus**	×				×			×		
2. **D. affinis**										
3. **D. sp.**										
4. **D. trinervis**						×				
5. **D. gracilis**						×				
6. **D. hasseltii**					×	×				
7. **D. vernicifluus**										
8. **D. sp.**										
9. **D. speciosus**										
10. **D. grandiflorus**			×	×				×		
11. **D. sp.**										
1. **Hopea basilanica**										
2. **H. mindanensis**										
3. **H. philippinensis**										
4. **H. plagata**										
5. **H. sp.**										
6. **H. sp.**										
7. **H. ovalifolia**				×		×				
8. **H. acuminata**										
9. **H. pierrei**		×	×	×						
10. **H. sp.**										
11. **H. sp.**										
1. **Pentacme contorta**										
2. **P. sp.**										
1. **Shorea balangeran**				×				×		
2. **S. malaanonan**										Madjang.
3. **S. philippinensis**										
4. **S. sp.**										
5. **S. guiso**										
6. **S. sp.**										
7. **S. negrosensis**										
8. **S. squamata**				×						
9. **S. eximia**			×	×	×			×		
10. **S. polysperma**										
11. **S. warburgii**										
12. **S. teysmanniana**								×		
13. **S. sp.**										
14. **S. sp.**										
1. **Parashorea plicata**				×						
1. **Vatica mangachapoi**										
2. **V. sp.**										
3. **V. sp.**										
4. **V. sp.**										
5. **V. sp.**										
	1	1	5	8	3	4	------	5	------	

Within the Philippines, the species which are most widely distributed are *Shorea guiso* and *Pentacme contorta.* It is probable that they occur in all the provinces.

USES.

Wood.—This family has already been indicated as the chief source of the commercial timbers for the Archipelago. It is possible that the waste from the saw-mills could be used to advantage. Mr. R. R. Williams, of the laboratory of organic chemistry of the Bureau of Science, has undertaken a series of experiments to determine the composition of the waste material from the saw-mills and the possibility of its commercial utilization. The following are some of the preliminary results of his work.

CHEMICAL UTILIZATION.

The valuable constituents of wood from the standpoint of their chemical utilization are cellulose and lignin. When the former predominates, as in conifers and soft woods generally, the latter may be removed by a suitable chemical method, and the cellulose utilized as paper pulp. The cellulose is also the valuable constituent for the production of ethyl alcohol and oxalic acid.

However the yields from destructive distillation depend on the amount of lignin or "incrusting matter" present. Judging from their weight and hardness dipterocarp woods might be expected to be better adapted for this purpose than any other, the more so as many of them contain resins of possible value which could be recovered by this means.

In Table II are given the results of a few experimental distillations of *palosapis,* red lauan, and *apitong.* About five kilos of wood were used for each experiment. Distillation was conducted in a cast-iron horizontal retort heated by gas. The temperature was controlled by a nitrogen-thermometer in the center of the retort.

Much depends upon the apparatus used and the skill exercised in conducting the process and results of various investigators are not readily comparable. Nevertheless the evidence is that *apitong,* and probably other moderately hard woods of this class, compare favorably with woods used in the United States for this purpose.

TABLE II.—*Distillation of Philippine Dipterocarp woods.*

No.	Class of wood.	H_2O.	Firing.	Watery distillate.		Tar.	Charcoal.	Uncondensed gases.	Yields of water-free wood.			
				Cc. per 100 g. of wood.	Acidity.				Acetic acid.	Wood alcohol.	Tar.	Charcoal.
		P.ct.				*P.ct.*	*P.ct.*	*P.ct.*	*P.ct.*	*P.ct.*	*P.ct.*	*P.ct.*
1	Palosapis green	22.4	Somewhat rapid.	50.9	4.04	2.0	20.5	24.0	2.66	------	2.7	26.4
2	Palosapis dry	11.2	Moderately slow.	46.0	6.25	4.1	23.7	25.2	3.26	------	4.6	28.4
3	Apitong dry	11.6	Slow	41.4	8.68	9.8	27.3	20.3	4.06	2.24	11.1	30.9
4	do	7.2	do	45.1	9.96	11.9	30.4	10.6	4.84	2.33	12.8	32.7
5	Lauan dry	8.0	Moderately slow.	41.9	6.15	5.3	29.1	22.2	2.85	------	5.8	31.6
6	do	5.0	Slightly slow.	34.5	9.91	5.6	30.3	28.1	3.59	------	5.9	31.9

Birch, beech, or maple under the same conditions would yield somewhat more acetic acid (5 to 6 per cent) and considerably less methyl alcohol (about 1 per cent), the latter being much the more valuable product of the two.

Apitong tar is a mobile black liquid which when distilled yielded—

Aqueous distillate, about 10 per cent.
Oily distillate 120°–150°, 8 per cent.
Oily distillate 150°–250°, 40 per cent.
Oily distillate 250°, 7 per cent.
Pitch, 34 per cent.

The low boiling oils (120°–150°) when further purified are almost colorless liquids of neutral reaction and pleasant odor. The high percentage of creosote oils (150° to 250°) is especially noteworthy as they constitute the most valuable fraction of the tar.

Paper pulp. Richmond[7] has shown that the wood of some species is suitable for the production of pulp for paper-making.

Wood oil. Under the name of *balao,* an oil is obtained from species of *Dipterocarpus* and *Anisoptera.* For a discussion of this oil, methods of collection, etc., see under *Dipterocarpus,* page 242.

Resin. In many species, as a result of injury, or for other reason, the resin accumulates in considerable masses, which are sometimes collected and disposed of under the name of dammar. It is used locally for torches and for caulking boats. Whitford[8] describes the method of collecting these resins. The resins of the dipterocarps have not become so important commercially in the Philippines as in other parts of the Malayan region.

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[7] Richmond, G. F. Philippine Fibers and Fibrous Substances: their Suitability for Paper Making. Part III. This Journal 2 (1907) A, 83–94.

[8] L. c. 55.

TAXONOMY.

The following generic key is adapted from Brandis. It includes *Pachynocarpus* and *Dryobalanops*, which have not yet been found in the Archipelago, because it seems probable that they may occur in the southern islands.

A. Calyx-wings longer than fruit.
  a. Fruit with 5 long wings.
    b. Stipule-scars encircling the twigs; leaves thin, glaucous beneath, with a fold between the distant secondary nerves.......... 6. *Parashorea*
    bb. Stipule-scars not encircling the twigs; leaves with finely crowded, parallel secondary nerves, coriaceous.......... *Dryobalanops*
  aa. Fruit with less than 5 long wings.
    b. Long wings 3.
      c. Secondary nerves close and numerous.......... 5. *Shorea*
      cc. Secondary nerves 6 or 7 and distant.......... 4. *Pentacme*
    bb. Long wings 2.
      c. Bark not resinous.......... 7. *Vatica*
      cc. Bark resinous.
        d. Calyx-tube not enclosing fruit.......... 3. *Hopea*
        dd. Calyx-tube enclosing fruit.
          e. Stipule-scars encircling twig; very large number of resin-canals in circumference of pith.......... 1. *Dipterocarpus*
          ee. Stipule-scars not encircling twig; 18–24 resin-canals in circumference of pith.......... 2. *Anisoptera*
AA. Calyx-wings shorter than fruit.......... *Pachynocarpus*

Previous to the days of American work in the Philippines, the principal collections of dipterocarps in the Islands were those of Cuming, Vidal, and Warburg. It seems to me advisable to give here a list of these collections, so far as they are known and my identifications for them.

PHILIPPINE DIPTEROCARPS COLLECTED BY CUMING.

880	Shorea eximia Miq.	Albay.
881	Dipterocarpus sp.	Albay.
882	Anisoptera thurifera (Blanco) Blume	Albay.
883	Shorea squamata Dyer	Albay.
884	Shorea balangeran (Korth.) Dyer	Albay.
892	Shorea squamata Dyer	Albay.
1073	Dipterocarpus grandiflorus Blanco	Albay.

DIPTEROCARPS COLLECTED BY WARBURG.

14431	Dipterocarpus pilosus Roxb.	Davao, Mindanao.
12399	Shorea warburgii Gilg	North Luzon.
s. n.	Parashorea plicata Brandis	Davao, Mindanao.
13430	Vatica mangachapoi Blanco	Candelaria, Zambales.

DIPTEROCARPS COLLECTED BY VIDAL.

68	Vatica mangachapoi Blanco	La Paz, Tarlac.
69	Vatica mangachapoi Blanco	La Paz, Tarlac.
70	Vatica mangachapoi Blanco	San Mateo, Rizal.
71	Shorea malaanonan (Blanco) Blume	San Mateo, Rizal.
72	Vatica mangachapoi Blanco	San Mateo, Rizal.
73	Anisoptera thurifera (Blanco) Blume	Caraballo Sur, Nueva Ecija.
74	Vatica mangachapoi Blanco	San Mateo, Rizal.
75	Vatica mangachapoi Blanco	Capas, Tarlac.
76	Parashorea plicata Brandis	San Mateo, Rizal.
77	Shorea malaanonan (Blanco) Blume	Calauan, La Laguna.
78	Vatica mangachapoi Blanco	San Mateo, Rizal.
79	Pentacme contorta (Vid.) M. & R.	Nueva Ecija and Capas, Tarlac.
80	Dipterocarpus vernicifluus Blanco	Angat, Bulacan.
81	Dipterocarpus vernicifluus Blanco	Bosoboso, Rizal.
82	Dipterocarpus affinis Brandis	Lupi, Camarines.
83	Anisoptera thurifera (Blanco) Blume	Antipolo, Rizal.
84	Hopea plagata (Blanco) Vid.	Bongabon, Nueva Ecija.
85	Anisoptera thurifera (Blanco) Blume	San Mateo, Rizal.
86	Anisoptera thurifera (Blanco) Blume	Bosoboso, Rizal.
87	Anisoptera thurifera (Blanco) Blume	Capas, Tarlac.
650	Dipterocarpus vernicifluus Blanco	Unisan, Tayabas.
651	Anisoptera thurifera (Blanco) Blume	Antipolo, Rizal.
983	Shorea philippinensis Brandis	Angat, Bulacan.
984	Shorea guiso (Blanco) Blume	Bosoboso, Rizal.
985	Anisoptera thurifera in part	Castillejos, Zambales.
986	Dipterocarpus grandiflorus Blanco	Angat, Bulacan.
987	Pentacme contorta (Vid.) M. & R.	San Isidro de Bosoboso, Rizal.
988	Vatica mangachapoi Blanco	Subani, Nueva Ecija.
989	Shorea malaanonan (Blanco) Blume	Bongabon, Nueva Ecija.
990	Parashorea plicata Brandis	Calauan, La Laguna.
991	Dipterocarpus vernicifluus Blanco	Montalban, Rizal.
992	Dipterocarpus vernicifluus Blanco	Castillejos, Zambales.
1120	Shorea furfuracea Miq.	Tivi, Albay.
1146	Shorea teysmanniana Dyer?	Angat, Bulacan.
1166	Pentacme contorta (Vid.) M. & R.	Ilocos Norte.
1167	Anisoptera thurifera, at least in part	San Mateo, Rizal.
2033	Parashorea plicata Brandis	San Mateo, Rizal.
2155	Shorea malaanonan (Blanco) Blume	Cardona, Rizal.
2156^{bis}	Shorea teysmanniana Dyer?	San Mateo, Rizal.
2157		San Mateo, Rizal.
2158	Anisoptera thurifera (Blanco) Blume	San Mateo, Rizal.
2159	Pentacme contorta (Vid.) M. & R.	Mauban, Tayabas.
2160	Dipterocarpus speciosus Brandis	Basilan.
2161	Dipterocarpus affinis Brandis	Baleno, Ticao.
2162	Shorea furfuracea Miq.	Castilla, Albay.
2163	Dipterocarpus vernicifluus Blanco	Castilla, Albay.
2164	Hopea philippinensis Dyer	Matnog, Albay.
2165	Anisoptera thurifera (Blanco) Blume	Cebu.
2166	Shorea malaanonan (Blanco) Blume	Morong, Rizal.
2167	Pentacme contorta (Vid.) M. & R.	Morong, Rizal.
2168	Shorea malaanonan (Blanco) Blume	Morong, Rizal.

DIPTEROCARPUS Gaertn. f.

Large trees, with long clear boles and rather thin, very resinous and scurfy bark. Leaves usually coriaceous, but membranaceous in *D. affinis* and in seedlings of *D. verniciflui* and other species. Leaves usually entire but sometimes retuse or even dentate (young *D. grandiflorus*). Stipules amplexicaul and leaving a pronounced scar encircling the twig. Secondary nerves mostly straight, joined by parallel and reticulate tertiary nerves. In the bud the two halves of the leaf are folded upon each other, and the sections contained between two secondary nerves are also folded in half. The folds between two secondary nerves in most species are clearly seen in the mature leaf, and in some cases the tertiary nerves show an angle along the line of this fold. Flowers large in few-flowered racemes which are sometimes branched. Stamens ∞, the anthers sometimes twisted. Connective prolonged into a long-pointed acumen. Tube of fruiting calyx not adnate to fruit, globose or ovoid, smooth or with five ribs or wings, alternating with segments, and formed by the decurrent margins of the segments, two of which develop into large membranaceous or chartaceous wings.

The pith of a leaf-bearing internode has a large number, up to 100, of resin-ducts, which sometimes are arranged in two concentric circles. The petiole below the insertion of the blade shows on the under side a semicircle of 5–12 half-moon-shaped vascular bundles, each with a resin-duct. This semicircle is more or less closed on the upper side by a bar of xylem with phloem outside. A central body of vascular bundles varying in shape, with 1–8 resin-ducts is present. In most species, there are large mucilage-cavities in pith and bark. This is the most distinct of our Philippine genera. The stipule-scar encircling the stem and the large number of resin-ducts in the circumference of the pith are enough to separate it even in sterile material. In many cases too, the twigs are very coarse, much more so than in our other genera.

Dipterocarpus, like *Anisoptera*, seems to be free from deposits of hard resin in the wood, but there is a very abundant flow of a sticky oil on freshly cut stumps. This oil is evident in freshly cut wood, and is in sufficient quantity to be of commercial importance. It is collected by chopping into the tree, often half way through the trunk, and leaving a big cavity where the oil can collect. The flow of oil is stimulated by firing, and sometimes amounts to more than one kilo per day. The oil is used for caulking boats and for illuminating purposes and it could probably be used in the making of varnish. Its chemistry has been studied by Clover[9] and Bacon.[10] It seems to be practically the same as the *gurjun* balsam of India and the *minyak krewing* of the Malay Peninsula. It is reputed to be useful in the treatment of gonorrhoea.

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[9] This Journal 1 (1906) 195.

[10] Ibid. 4 (1909) A 121.

Of course, the chopping into the trees to get the flow of oil is very injurious to them and causes the destruction of much good timber by leaving the tree a prey to fungous attack. In some localities nearly all the mature *Dipterocarpus* trees are tapped. In spite of this loss of standing timber, the collection of the oil may be justified from the viewpoint of practical forestry, wherever the value of the oil is greater than that of the timber destroyed. It would certainly seem, however, that the tree which had been tapped should be felled, whenever it has ceased to yield oil. I do not know how long a tree will continue to yield oil, nor whether it would be desirable to make successive tappings, nor whether it would be feasible to extract the oil from the wood by distillation. The bark does not seem to be a commercial source of the oil, although it does contain an oily or mucilaginous substance in some quantity.

The timber is grayish-red, coarse-grained, moderately hard and moderately heavy. It is remarkably uniform in structure for the different species, although there is a considerable range in texture and hardness. It is much subject to termite attack, but in places where it is protected from excessive moisture and from termite attack, it should be quite durable. It has a great deal of strength and stiffness and is well suited to heavy construction work and framing. It is in fair demand and commands a price of 70 to 90 pesos ($35 to $45) per thousand feet B. M. on the Manila market. The trees are of good shape and are readily logged, but the logs behave badly on the saw. The large amount of gummy oil present interferes with sawing, dulling the saws quickly and even pulling the teeth out now and then. It is customary to keep a stream of water dripping on the running saw to lessen this difficulty. In spite of this disadvantage in conversion, the handling of this timber is a very profitable business.

All of our species are gregarious in habit. Some species, e. g. *D. grandiflorus*. are often found on steep and exposed dry ridges; others, like *D. pilosus*, are more often found on low flat land.

The genus contains about 60 species, 11 of them being found in the Philippines. Of the Philippine species, 5 are known to be extra-Philippine in distribution, and it is quite likely that this will be found to be true of a greater number of our species, when we know them better.

Leaf fall and seasonal growth.—Dipterocarpus grandiflorus, at any rate, and probably other species, shows a distinct periodicity in leaf fall. It seems that each tree sheds all of its leaves each year and at about the same time; but the tree is never leafless. It seems that the tree has the new leaves ready formed in the bud and that the old leaves do not fall till pushed off by the expansion of the new. Brandis, l. c. 9 says: "Most dipterocarps are evergreen, the old leaves falling soon after the young foliage has developed." Kurz,[11] says, "These wood-oil trees are strictly no evergreens, but the succession of leaf-shedding and leaf-forming is here so rapid, that young leaves are already developed, while the old ones are still falling off."

This leaf-fall seems to occur at some time during the dry season; in Bataan Province during the month of January and in the northern part of Negros Occidental in August or September. Our knowledge of meteorological conditions in the Islands is so meager that we can not more definitely indicate the season at present. I believe the time of leaf fall to be near the time of flowering, but I do not know whether it may come a little earlier or a little later.

Our species seem to flower and fruit annually. The flowering season seems to be rather short, and it takes some months for the fruit to mature. The fruit is usually borne in great abundance. It sprouts very soon after falling to the ground, sometimes even before falling from the tree.

Key to the Philippine Species of Dipterocarpus.

a. Fruit not angled, usually globose (Section SPHAERALES.)
b. Leaves small (10–13 cm long, 2–3.5 cm broad), narrow, long-caudate-acuminate .... 8. *D.* sp. from Tayabas
bb. Leaves larger, not long-caudate-acuminate.
c. Fruit less than 2 cm in diameter.
d. Leaves and buds hairy .... 7. *D. vernicifluus*
dd. Leaves and buds glabrous .... 6. *D. hasseltii*
cc. Fruit more than 2 cm in diameter.
d. Fruit obconical or top-shaped .... 3. *D.* sp.
dd. Fruit globose.
e. Leaves and young shoots brown-hairy.
f. Leaves long and narrow, membranaceous .... 2. *D. affinis*
ff. Leaves broader, usually coriaceous .... 1. *D. pilosus*
ee. Leaves and young shoots not brown-hairy.
f. Secondary nerves 10–12 pairs .... 5. *D. gracilis*
ff. Secondary nerves 16–20 pairs .... 4. *D. trinervis*
aa. Fruit angled, with ridges or wings (Section ALATI.)
b. Fruit very heavy and woody, with the wings reduced to thick ridges .... 9. *D. speciosus*
bb. Fruit with membranaceous wings.
c. Leaves glabrous or nearly so .... 10. *D. grandiflorus*
cc. Leaves hairy .... 11. *D.* sp.

Section I. SPHAERALES. Tube of fruiting calyx oblately or prolately spheroidal, without angles.

1. **Dipterocarpus pilosus** Roxb. Hort. Beng. (1814) 93, nomen, Fl. Ind. (1832) 615; Dyer in Journ. Bot. **12** (1874) 103, Hook. f. Fl. Brit. Ind. **1** (1874) 296; A. DC. Prodr. $\mathbf{16}^{2}$ (1868) 614; Kurz For. Fl. Brit. Burma **1** (1877) 115; F.-Vill. Noviss. App. (1880) 20; Vidal Sinopsis Atlas (1883) xv, *t. 14 f. D;* Burck in Ann. Jard. Bot. Buitenz. **6** (1887) 199; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 27. Plate XXXIV.

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[11] Forest Flora of Pegu (1875) 31.

D. baudii Korth. in Verh. Nat. Gesch. Bot. (1839–42) 59, *t. 5*; Scheffer in Nat. Tijdschr. Ned. Ind. **31** (1870) 347; Kurz in Journ. Asiat. Soc. Beng. $\mathbf{39}^2$ (1870) 65; A. DC. Prodr. l. c. 609; Miq. Fl. Ind. Bat. 1^2 (1859) 497; Suppl. Fl. Sumatr. (1862) 485; Burck l. c. 198.

Anisoptera ? palembanica Miq. Fl. Sumatr. (1862) 497; Kurz in Journ. Asiat. Soc. Beng. $\mathbf{39}^2$ (1870) 65.

D. macrocarpus Vesque in Compt. Rend. **78** (1874) 627; Dyer in Journ. Bot. **12** (1874) 153.

D. warburgii Brandis in Journ. Linn. Soc. Bot. **31** (1895) 32.

D. lasiopodus Perk. in Frag. Fl. Philip. **1** (1904) 22; Merr. in Bur. Govt. Lab. Publ. (Philip.) **29** (1905) 30.

D. affinis Whitford in Philip. Bur. For. Bull. $\mathbf{10}^2$ (1911) 70, *pls. 72, 73*, non Brandis.

Trees 30 to 40 m high, the younger branchlets densely covered with brush-like, fascicled, tawny, stiff hairs; stipules rose-colored, up to 15 cm long, brushy-hirsute; leaves of younger branchlets very large, 30 to 45 cm long and of a thinner texture, the older ones smaller, broadly oblong to ovate-oblong, obtuse or rounded at the somewhat narrowed base, on a 5 cm brushy-hirsute petiole, shortly acuminate, chartaceous, or almost coriaceous, upper surface along the impressed nerves and lower surface everywhere pubescent with short, tawny, stellate and simple hairs. Flowers showy, rose-colored, forming simple, short, axillary racemes covered with brush-like, fascicled, stiff hairs; calyx tawny-tomentose with stellate hairs; petals oblong, blunt, several times the length of the calyx, thickly covered on their outer surface with stellate hairs; fruiting calyx ovoid, about 2.5 cm in diameter, terete, the two wing-like lobes 17 to 20 cm long, 3 to 4 cm broad, with three prominent longitudinal veins and numerous, more or less distinct, transverse veins. Fruit hard and heavy, more or less fibrous inside, and containing resin; upper portion of the fruit with or without small obtuse, rounded protuberances, which alternate with the lobes of the calyx.

Dipterocarpus warburgii Brandis and *D. lasiopodus Perk.* were described as belonging in the Section *Tuberculati*, but they were described from fragmentary or immature material, which does not present very conclusive evidence of their belonging to that section. Leaf and fruit characters of *D. pilosus*, as shown by our collections, have shown such a range of variability that it has seemed to me best to refer the above names to synonymy. It is possible that more complete material may show them to be good species, but at present I can see no reason for keeping them distinct.

LUZON, Province of Cagayan, *For. Bur. 17171, 17262 Curran*: Province of Nueva Ecija, *For. Bur. 22146 Alvarez*, Dec. 1910, flower and young fruit, *For. Bur. 22345 Alvarez*: Province of Tayabas, Vidal *l.* c., pictures a fruit of this species from the Island of Alabat, *Merrill 2004, 2031 Hagger*, April 1903 (these two numbers were mentioned by Perkins under *D. lasiopodus*), *For. Bur. 6054 Kobbe, For. Bur. 10222, 10291, 10298 Curran, For. Bur. 11505 Whitford, For.*

Bur. 14995 Darling, Oct. 1909, in fruit, *For. Bur. 18668 Darling*, Nov. 1909, in fruit, *For. Bur. 18686 Darling*, Nov. 1909, in flower, *Bur. Sci. 13123 Foxworthy & Ramos*, Mar. 1911, in flower and fruit: Province of Camarines, *For. Bur. 10492, 10675, 10706, Curran, For. Bur. 10738, 10783 Curran*, July 1908, in fruit and flower. POLILLO, *Bur. Sci. 10281 McGregor*. MINDORO, *Whitford 1404*, Jan. 1906, in flower, *Whitford 1477*, Mar. 1906, in fruit. MARINDUQUE, *For. Bur. 12157 Rosenbluth*. SAMAR, *For. Bur. 12838 Rosenbluth*. LEYTE, *For. Bur. 11628 Whitford*, Mar. 1909, in fruit. MINDANAO, District of Davao, *Warburg 14431* (type of *D. warburgii*), *For. Bur. 11559 Whitford*, Feb. 1909, flowers and young fruit: District of Zamboanga, *For. Bur. 9395, Whitford & Hutchinson*, Feb. 1908, fruit, *For. Bur. 12352 Hutchinson*, May 1908, flower.

The flowers and young fruit show a five-ridged calyx. As the fruit matures, the hollows fill out and the fruit becomes more nearly spherical till finally the only remaining trace of the ridges is found in small, rounded protuberances, on the upper part of the fruit, alternating with the calyx lobes.

The common native name for this species is *hagachac*. It is commonly found in those regions which have a comparatively even rainfall. It occurs on flat lands and low hills. It is gregarious in habit and frequently makes up the greater part of the stand where it occurs.

Distribution: damp forests in the upper part of the Assam valley; Chittagong hills; Arracan; lower Pegu, hills between the rivers Sitang and Salween; Andaman Islands; Sumatra; Bangka; the Philippines.

2. **Dipterocarpus affinis** Brandis Journ. Linn. Soc. Bot. 31 (1895) 31. Plate XXXV.

Branches and petioles stellate-tomentose. Leaves submembranaceous, oblanceolate, repand, blade 27 to 33 cm long; petioles 6 to 7 cm. Secondary nerves 24 to 28 pairs, straight, bent near margin and terminating in reticulate intra-marginal veins. Tertiary nerves parallel and reticulate. Stipules linear, tomentose, twice as long as the petioles. Flowers large, short-pedicellate. Calyx-tube thickly coriaceous, turbinate, smooth and glabrous, the lobes 2 linear, 3 short, reflexed. Ovary, stylopodium, and lower part of style pilose. Pubescence the same as that of *D. pilosus*. Brandis says that the difference between the two species consists in the narrow membranaceous leaves and the glabrous calyx of *D. affinis*, the smaller segments in flower reflexed, and not erect.

A number of specimens in our herbarium seem to fit this description and have fruit with them, which shows the short calyx wings slightly reflexed, but in no case is the fruit collected with the herbarium material actually attached to it, the fruits seeming to have been picked up from the ground. This leaves the suspicion that the membranaceous texture of the leaves may be due to their being young or seedling leaves, possibly immature forms of *D. pilosus*. The differences in the reflexed or erect calyx lobes are also very slight and might conceiveably be fortuitous or due to drying.

I have checked Brandis' observation of the very close resemblance and possible identity of *D. elongatus* Korth. and *D. affinis*, and think it probable that they are identical and possible that they both will have to be referred to *D. pilosus*. This is particularly likely in view of the extreme variability in size, shape, and texture of the leaves at different ages in species of this genus. It will, however, require careful observation in the field before any such reduction can safely be made.

LUZON, Province of Cagayan, *For. Bur. 5248 Klemme, For. Bur. 17213, 17233 Curran, For. Bur. 18501 Alvarez:* Province of Tayabas, *For. Bur. 10374 Curran:* Province of Camarines, *Vidal 82, For. Bur. 10660 Curran.* TICAO, *Vidal 2161.* MINDANAO, District of Zamboanga, *For. Bur. 7555 Hutchinson, For. Bur. 9433 Whitford & Hutchinson.*

Common names: *camuyao* (Cag.), *hagachac* (Tag.), *liput* (Manobo).

3. **Dipterocarpus** sp. aff. *D. turbinato* Gaertn. f. Plate XXXIX.

A form with fruit which is distinctly obconical or top-shaped. Leaves and buds glabrous or nearly so, resembling material of *D. turbinatus* var. *andamanicus* King. Our material is all fragmentary, the fruit having been collected on the ground under the trees. Vidal, Sinopsis, Atlas (1883) xv, *t. 14, f. c.* represents a fruit which he calls *D. turbinatus* and which is said to have been brought from the Island of Panay. The fruit figured by Vidal is apparently not so top-shaped as in the specimens cited below.

Some of the material from the Malay Peninsula in the herbarium at Kew under the name of *D. turbinatus* has fruit very much like the following:

LUZON, Province of La Laguna, *For. Bur. 8864, 10074, 19261 Curran:* Province of Tayabas, *For. Bur. s. n., For. Bur. 3223 Hagger, For. Bur. 6045 Kobbe, For. Bur. 12500 Rosenbluth:* Province of Albay, *Cuming 881:* Province of Sorsogon, *For. Bur. 10564 Curran.*

This species seems to be fairly common in dense forests on low ridges in some parts of Tayabas.

Common names: *apitong* (Tag.), *patsahingin* (Tag.).

4. **Dipterocarpus trinervis** Blume Cat. Buitenz. (1823) 78, *tab.*, Bijdr. (1823) 223, Fl. Javae (1829) 11, *t. 1*, Verhandl. Bat. Genootsch. **9** (1825) 178; Korth. Verh. Nat. Gesch. Kruidkunde **1** (1848) 61; De Vriese in Miquel Pl. Jungh. **1** (1851) 83; Miq. Fl. Ind. Bat. **1**² (1859) 496; A. DC. Prodr. **16**² (1868) 608; Dyer in Journ. Bot. **12** (1874) 102; Burck in Ann. Jard. Bot. Buitenz. **6** (1887) 195; Brandis & Gilg in Engler & Prantl Nat. Pflanzenfam. **3**⁶ (1894) 257, *f. 119, F;* Brandis in Journ. Linn. Soc. Bot. **31** (1895) 30.

Leaves and fruit larger than in *D. hasseltii;* secondary nerves 16 to 20 pairs; petiole one-fourth to one-sixth the length of the blade. Fruit more than 2 cm in diameter.

Represented in our collection by only two detached old leaves from Palawan. The determination is therefore rather doubtful.

PALAWAN, *For. Bur. 12272 Wallace.*

Common name: *apitong* (Vis.).

Distribution: Java and the Philippines.

5. **Dipterocarpus gracilis** Blume Bijdr. (1825) 224, Fl. Javae (1828–29) 20, *t. 5;* Miq. Fl. Ind. Bat. 1^2 (1859) 497; A. DC. Prodr. 16^2 (1868) 609; Dyer in Journ. Bot. 12 (1874) 102; Burck in Ann. Jard. Bot. Buitenz. 6 (1887) 196; Brandis & Gilg in Engler & Prantl Nat. Pflanzenfam. 3^6 (1894) 257, *f. 119, A-D;* Brandis in Journ. Linn. Soc. Bot. 31 (1895) 30.

Pubescent. Leaves small, ovate-lanceolate, secondary nerves 10 to 12 pairs, stellate-pubescent beneath. Calyx in flower with two subopposite, linear lobes of about the same length as the calyx-tube, the other three lobes very short and reflexed. Petals twice as long as the calyx, linear-spatulate, obtuse, white-sericeous outside, rose-color within, convolute in bud. Stamens with short glabrous filaments; anthers twice as long as the filaments, with a long setaceous connective. Fruit 2 cm in diameter.

LUZON, Province of Camarines, *For. Bur. 10740 Curran*, July 1908, in fruit. MINDORO, *For. Bur. 4101, 4106 Merritt*, May 1906, in flower and fruit.

Common names: *anahaun* (Tag.), *apitong* (Tag.).

Distribution: forests of West Java; the Philippines.

6. **Dipterocarpus hasseltii** Blume Fl. Javae (1828–29) 22, *t. 6;* Dyer in Journ. Bot. 12 (1874) 102; Hance in Journ. Bot. 16 (1876) 241; A. DC. Prodr. 16^2 (1868) 609; Miq. Flora Ind. Bat. 1^2 (1859) 497; Vidal Phan. Cum. Philip. (1885) 97; Burck in Ann. Jard. Bot. Buitenz. 6 (1887) 196; Brandis in Journ. Linn. Soc. Bot. 31 (1895) 30; Koord. & Val. Bijdr. Ken. Boomsoort. Java 5 (1900) 109; Whitford in Philip. Bur. For. Bull. 10^2 (1911) 70.

Buds and young branchlets glabrous. Terminal buds elongate, attenuate, curved. Leaves much smaller than those of *D. trinervis*, oval, acute, base subcuneate, 11 to 18 cm long, 6 to 10 cm wide; secondary nerves 10 to 14 pairs; petiole one-third to one-fourth the length of the blade. Fruit 1 to 2 cm in diameter, the calyx-tube much constricted at the top.

This species presents an appearance extraordinarily like that of *D. verniciflúus*, from which it differs in its more glabrous leaves and in its elongate, attenuate, curved and glabrous terminal buds.

LUZON, Province of Nueva Ecija, *For. Bur. 22145 Alvarez:* Province of La Laguna, *For. Bur. 10105 Curran.* NEGROS, Gimagaan River, *For. Bur. 13589 Meyer & Foxworthy*, Aug. 1909, in fruit. MINDANAO, District of Zamboanga, *For. Bur. 12350 Hutchinson.*

Common names: *panao* (Tag.), *pagsahingan* (Tag.).

Distribution: Malacca; Sumatra; Java; the Philippines.

7. **Dipterocarpus vernicifluus** Blanco Fl. Filip. ed. 2 (1845) 314, ed. 3 2 (1878) 217, *t. 183;* Dyer in Journ. Bot. 12 (1874) 104; Vidal Sinopsis Atlas (1883) xv, *t. 14, f. B:* Rev. Pl. Vasc. Filip. (1886) 59; Brandis in Journ. Linn. Soc. Bot. 31 (1895) 31; A. DC. Prodr. 16^2 (1868) 610; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 97; Merrill & Rolfe in Philip. Journ. Sci. 3 (1908) Bot. 114; Foxworthy in Philip. Journ. Sci. 2 (1907) Bot. 391, 4 (1909) Bot. 514; Merritt in Philip. Bur. For. Bull. 8 (1908) 48; Whitford in Philip. Journ. Sci. 4 (1910) Bot. 703, Whitford in Philip. Bur. For. Bull. 10^2 (1911) 70, *pls. 70, 71.*

Mocanera verniciflua Blanco Fl. Filip. (1837) 451.

D. fulvus Blume Mus. Bot. Lugd.-Bat. 2 (1856) 37; Miq. Fl. Ind. Bat. 1^2 (1859) 499; F.-Vill. Noviss. App. (1880) 20; A. DC. Prodr. l. c. 613; Dyer l. c. 108; Merrill & Rolfe l. c. 114.

D. hispidus F.-Vill. l. c. 20, non Thwait. Enum. Pl. Zeyl. (1859) 33.

D. turbinatus F.-Vill. l. c. 20, non Gaertn. f. Fruct. 3 (1805) 51.

D. velutinus Vidal Pl. Vasc. Filip. (1886) 59; Perk. Frag. Fl. Philip. (1904) 22; Merrill & Rolfe l. c. 114.

Leaves chartaceous, elliptic-oblong, acuminate; midrib and secondary nerves (14 pairs) clothed when quite young with very long whitish hairs, some of which remain on the adult leaf; petioles long, one-third to one-fourth the length of blade. Calyx 4- or 5-angled. Anthers subulate but not aristate (Blanco). Fruit globose, constricted at apex, not angled, 1.5 to 2 cm in diameter. Seedling leaves very much larger and more hairy than mature leaves, also very often with a larger number of secondary veins.

This is, next to *D. grandiflorus*, our best-known species. It is very widely distributed in the Archipelago and is rather variable. It is sometimes almost glabrous and may intergrade with *D. hasseltii*.

It has been found in flower during the months of January, March, April, May, and June, and in fruit in the months of April, May, June, and July.

LUZON, Province of Cagayan, *For. Bur. 14715, 14731 Darling, For. Bur. 17168, 17211, 17238, 17261 Curran:* Province of Ilocos Norte, *For. Bur. 13922, 13925, 13927 Merritt & Darling:* Province of Ilocos Sur, *For. Bur. 14091 Merritt & Darling:* Province of Isabela, *For. Bur. 18552 Alvarez:* Province of Pangasinan, *For. Bur. 8333 Curran & Merritt, For. Bur. 13457 Medina:* Province of Nueva Ecija, *For. Bur. 22374 Alvarez:* Province of Bulacan, *For. Bur. 7160 Curran, For. Bur. 11156 Aguilar:* Province of Pampanga, *For. Bur. 17736 Curran:* Province of Zambales, *Vidal 992, Merrill 1754 Garcia*, April 1903, in flower, *For. Bur. 5819, 6000, 6918, 6929 Curran, For. Bur. 13207 Cortes, For. Bur. 19468 Agama:* Province of Bataan, *Merrill 1479 Garcia, Williams* 788, March 1904, in flower, *Whitford 309, 310*, May 1904, in flower, *Whitford 1366, 1466, For. Bur. 498, 501, 505, 524, 526, 537, 539, 552, 561, 568, 577, 580, 592, 603, 609 Barnes, For. Bur. 358, 537, 556 Barnes*, March 1904, in flower, *For. Bur. 654, 655, 656, 664, 665, 666 Borden*, April 1904, in flower and fruit, *For. Bur. 810 Borden*, June 1904, in flower, *For. Bur. 2911 Borden*, March, 1905, in flower, *For. Bur. 1404, 1408, 1524, 1526, 1532, 1537, 1612, 1634, 1685, 1688, 2131 Borden, Bur. Sci. 1568 Foxworthy, For. Bur. 5277, 5946 Curran, For. Bur. 5955 Curran*, January, 1907, in flower, *For. Bur. 7343 Curran*, June 1907, in fruit, *For. Bur. 12946 Alvarez:* Province of Rizal, *Vidal 81, 991, Merrill 2656 Ramos*, June 1903, in fruit, *Merrill 2836 Ramos*, July 1903, in fruit, *Dec. Phil. For. Fl. 36 Ahern's Coll.*, March 1904, in flower, *Bur. Sci. 1459 Ramos, For. Bur. 10012, 10013 Curran:* Province of La Laguna, *For. Bur. 10070, 10072, 10075 Curran, Bur. Sci. 8977 Foxworthy*, July 1909, in fruit, *For. Bur. 15096 Cortez, For. Bur. 15346; 15348 Tamesis, For. Bur. 22231 Mariano:* Province of Tayabas, *For. Bur. 10372 Curran, For. Bur. 10391 Curran*, May 1908, in flower, *For. Bur. 18650 Darling*, Nov. 1909, in fruit: Province of Camarines, *For. Bur. 10718 Curran:* Province of Albay, *Vidal 2163.* POLILLO, *For. Bur. 3316 Hagger*, July 1904, in fruit, *Bur. Sci. 10781 McGregor.*

MARINDUQUE, *For. Bur. 12160 Rosenbluth.* MINDORO, *For. Bur. 8836, 12034 Merritt.* LEYTE, *For. Bur. 12739 Rosenbluth.* MINDANAO, Province of Surigao, *For. Bur. 7565 Hutchinson:* District of Davao, *For. Bur. 11569 Whitford:* District of Zamboanga, *For. Bur. 9041 Whitford & Hutchinson.* PALAWAN, *For. Bur. s. n. Curran.*

Native names, *panao, apitong* (Tag.), *kamuyao* (Cag.), *malapaho* (Polillo), *pagsahingin* (Tag.).

8. **Dipterocarpus** sp.

A form with long-caudate-acuminate leaves, 10 to 13 cm long, 2–3.5 cm broad, glabrous. Stipules linear, ferruginous-pilose. Old and fragmentary fruit picked up under the tree shows the plant to belong to this section of the genus.

LUZON, Province of Albay, *For. Bur. 10607, 10610, Curran,* June 1908.

Common name: *apitong* (Tag.).

Section II. ALATI. Tube of fruiting calyx with angles more or less produced into wings.

9. **Dipterocarpus speciosus** Brandis in Journ. Linn. Soc. Bot. **31** (1895) 38; Perkins in Fragm. Fl. Philip. (1904) 22; Whitford in Philip. Bur. For. Bull. **10**^{2} (1911) 70. Plate XXXVII.

Young branchlets covered with long, fasciculate, fuscous, stellate hairs. Leaves chartaceous, short-petiolate, oblong-elliptic, with scattered, very short, stellate hairs on the midrib beneath. Petiole with long, clustered, fuscous, stellate hairs. Leaves 15 to 27.5 cm long; petiole 18 mm long; secondary nerves 18 pairs; tertiary nerves parallel and reticulate.

Our material has petioles longer than are described for the species, but the petioles of *D. grandiflorus* and related forms seem to show considerable variation in length. The hairiness of young shoots and petioles is probably also a variable character. The thick edge of the fruit wings is the most striking feature. There is a considerable range of variation from an exceedingly heavy and woody fruit where the wings are reduced to ridges, to a condition where the wings are almost as membranaceous as in *D. grandiflorus.* Where these two species occur side by side in Negros, there seem to be numerous intergrades. I believe that natural hybridization has taken place.

LUZON, Province of Tayabas, *Merrill 1149 Garcia:* Province of Camarines, *For. Bur. 10741, 10765 Curran:* Province of Albay, *For. Bur. 10616 Curran.* NEGROS, Gimagaan River, *For. Bur. 7406 Danao, For. Bur. 17351, 17366 Curran.* BASILAN, *Vidal 2160.* In addition to the above, there is *For. Bur. 10711 Curran,* from the Province of Camarines, Luzon. The leaves of this specimen are very large, almost round, very hairy, with crenate margins. The fruit seems to belong to *D. speciosus,* but it was picked up from the ground and may have come from another tree.

Mr. Curran tells me that in Negros, where he has studied this species in the field, the petioles are regularly shorter than those of *D. grandiflorus,* the veins appear to be more numerous, the buds seem to be longer and to be pubescent or hairy, and the fruit is thicker, much heavier, occasionally so filled out that the ridges do not appear in the lower part of the fruit. The bark is very light-colored, like that of *D. grandiflorus*.

Common names: *anahaun, apitong* (Tag., Vis.).

10. **Dipterocarpus grandiflorus** Blanco Fl. Filip. ed. 2 (1845) 314; ed. 3, 2 (1878) 218, *t. 263;* A. DC. Prodr. 16^2 (1868) 611; Dyer in Journ. Bot. 12 (1874) 106; Vidal Sinopsis Atlas (1883) xv, *t. 14, f. A*, Phan. Cum. Philip. (1885) 96, Rev. Pl. Vasc. Filip. (1886) 59; Burck in Ann. Jard. Bot. Buitenz. 6 (1887) 201; King in Journ. Asiat. Soc. Bengal 62^2 (1893) 95; Brandis & Gilg, in Engler & Prantl Nat. Pflanzenfam. 3^6 (1894) 257, *f. 119, H;* Brandis in Journ. Linn. Soc. Bot. 31 (1895) 37; Ceron Cat. Pl. Herb. (1892) 25; Merr. in Phil. Journ. Sci. 1 (1906) Suppl. 97; Foxworthy in Philip. Journ. Sci. 2 (1907) Bot. 372, 4 (1909) Bot. 513, *pl. 27, f. 71;* Everett & Whitford in Philip. Bur. For. Bull. 5 (1906) 16, 25; Merritt in Philip. Bur. For. Bull. 8 (1908) 48; Whitford in Philip. Journ. Sci. 4 (1910) Bot. 703, Philip. Bur. For. Bull. 10^2 (1911) 69, *pls. 68, 69*. Plate XXXVI.

Mocanera grandiflora Blanco l. c. ed. 1 (1837) 451.

D. blancoi Blume Mus. Bot. Lugd.-Bat. 2 (1856) 35; Dyer in Journ. Bot. 12 (1874) 106.

Anisoptera ? Turcz. in Bull. Soc. Nat. Moscou 31^1 (1858) 233; Dyer l. c. 106.

D. motleyanus Hook. f. in Trans. Linn. Soc. Bot. 23 (1860) 159; A. DC. l. c. 611; Dyer l. c. 106; F.-Vill. Noviss. App. (1880) 20.

D. griffithii Vid. in Cat. Pl. Prov. Manila (1880) 18, non Miq. in Ann. Mus. Bot. 1 (1864) 213; F.-Vill. l. c. 20.

D. pterygocalyx Scheffer in Nat. Tidschr. Nederl. Ind. 31 (1870) 347; Dyer in Hook. f. Fl. Brit. Ind. 1 (1874) 298.

Trees 24 to 40 m high; young branches rather stout, subcompressed, at first hoary-puberulous, but finally quite glabrous, nearly black when dry; leaf-buds shortly ovoid, minutely pale-canescent. Leaves coriaceous, ovate-elliptic, shortly acuminate; the base broad, rounded or subtruncate, subcordate, the edges of mature leaves entire or obscurely undulate-crenate, both surfaces glabrous; secondary nerves 14 to 16 pairs, spreading, rather straight, prominent on the lower, obsolete on the upper surface, length 15 to 23 cm, breadth 8 to 13 cm; petiole 5 to 7.5 cm long, glabrous. Racemes about 4-flowered. Flowers articulated to the rachis, 5 cm long, rose-colored, fragrant. Calyx-tube 5-winged from base to apex. Petals linear-oblong. Fruit oblong, 5 cm long, wings stout, more than 1 cm wide; the two accrescent lobes of the calyx oblong, obtuse, glabrous, reticulate, 18 to 23 cm long and 3 to 5 cm broad, 3-nerved, the medial nerve the longest and most distinct, the smaller calyx lobes suborbicular.

This is much the best-known representative of the family in the Philippines. It has been found in all parts of the Islands except Mindanao. It seems to be more variable than any other of our species, but this may be because we do not know the other species so well. The margins of seedling leaves are found to vary all the way from coarsely dentate to entire. The petiole has quite a considerable variation in length. The fruit varies in size and shape and in length of wings, as well as in the degree of development of the fruit wings, which are usually quite papery but may be reduced to little more than ridges. There seems to be an almost complete series of intergrades between the typical fruit for this species and the very much more woody fruit of *D. speciosus*. It seems likely that these species hybridize, where they occur in the same region. The fruit-wings are of varying length and there may be three long wings developed or only one. The stipules, in the terminal bud, elongate to such an extent before falling that they give the plant the appearance of belonging to an entirely different species. I have seen these enlarged stipules as much as 2 dm long. They are much in evidence on the ground just after the leaves have fallen.

D. grandiflorus is often found on dry exposed ridges up to 500 m above sea level, but it also does well on flat land which is more moist. It seems to be the principal source of the *balao* or wood oil in the Philippines.

It has been found in flower in the months of January, February, March, April, May, June and December, and in fruit in the months of January, February, May, June, August and September.

LUZON, Province of Cagayan, *For. Bur. 7067 Klemme*, May 1907, in flower, *For. Bur. 13102 Bernardo*, April 1909, in flower, *For. Bur. 13421 Klemme*, April 1909, in flower, *For. Bur. 14719, 14754 Darling, For. Bur. 16925* (from Palaui Island), *16947, 16959, 17046, 17061, 17167, 17189 Curran, For. Bur. 18441 Alvarez:* Province of Isabela, *For. Bur. 14837 Darling*, May 1909, in fruit: Province of Ilocos Sur, *For. Bur. 5658 Klemme:* Province of Abra, *For. Bur. 14657 Darling*, Feb. 1909, in fruit: Subprovince of Benguet, *Elmer 6453*, June 1904, in fruit: Province of Pangasinan, *For. Bur. 8335 Curran & Merritt*, Dec. 1907, in flower, *For. Bur. 13490 Medina:* Province of Nueva Ecija, *For. Bur. 22372 Alvarez:* Province of Zambales, *Cuming 1073, Hallier 306, For. Bur. 914 Maule, For. Bur. 5812, 6917 Curran, For. Bur. 6021 Aguilar, For. Bur. 8115 Curran & Merritt*, Dec. 1907, in flower, *For. Bur. 8417 Curran & Merritt:* Province of Bataan, *Ahern 755 Hereford, Whitford 8x*, June 1904, in fruit, *Whitford 785*, Sept. 1904, in fruit, *Williams 904, For. Bur. 186 Barnes*, Jan. 1904, in flower, *For. Bur. 559 Barnes, For. Bur. 2908 Borden*, Mar. 1905, in flower, *For. Bur. 5941, 5943 Curran*, Jan. 1907, in flower and fruit, *For. Bur. 6228 Curran*, Feb. 1907, in flower, *For. Bur. 7231 Curran*, June 1907, in flower, *Bur. Sci. 1591 Foxworthy, For. Bur. 12947 Alvarez, For. Bur. 20022 Topacio:* Province of Bulacan, *Vidal 986, For. Bur. 7177 Curran*, June 1907, in fruit, *Bur. Sci. 12268 Foxworthy:* Province of Rizal, *For. Bur. 2867 Ahern's coll.*, Mar. 1905, in flower: Province of La Laguna, *For. Bur. 17639 Curran, For. Bur. 22237 Mariano:* Province of Tayabas, *For. Bur. s. n., 3222, 3209 Hagger*, April 1905, in flower, *For. Bur. 10195 Curran, For. Bur. 18665 Darling:* Province of Camarines, *For. Bur. 10717 Curran:* Province of Albay, *For. Bur. 10614 Curran*. MINDORO, *For. Bur. 6160, 6811, 8802 Merritt*. SAMAR, *For. Bur. 12850 Rosenbluth*. NEGROS, Gimagaan River, *Whitford 1586, 1622, For. Bur. 5501 Everett, For. Bur. 13595 Meyer & Foxworthy*, Aug. 1909, in fruit, *For. Bur. 17481, 17486, Curran, For. Bur. 18223 Rosenbluth, For. Bur. 15021 Danao*, Mar. 1908, in flower. PALAWAN, *For. Bur.*

Native names: *apitong* (Tag.), *anahauon* (B.), *balao* (Tag.), (Cag.), *duko* (N. Luz.), *kamuyao* (V., Il.), *malapaho* (Tag.), *pagsahingin* (Tag.), *pamalalian* (Cag.), *pamantuling* (Pang., Il.), *panao* (Tag.).

Distribution: Penang; Malay Peninsula, Perak, Malacca, Johore; Bangka; Borneo; the Philippines.

11. **Dipterocarpus** sp. Plate XXXVIII.

Large tree, 30 m high, 75 cm in diameter. Mature leaves ovate-lanceolate, acute, base truncate, margin entire, 19 cm long, 11 to 12 cm wide; secondary nerves 18 pairs; tertiary nerves parallel and reticulate, with stellate hairs; petiole 5 cm long. Young shoots and seedling leaves ferruginous, hairy, exceedingly like the same parts in *D. vernicifluus*. Fruit much the size and shape of that of *D. marginatus* but more constricted at the top and with the ridges produced into membranaceous wings, as in *D. grandiflorus*. Fruit 3 to 3.5 cm long and 2 to 2.5 cm in diameter, the two long wings 15 to 17 cm long and 25 to 28 mm wide.

LUZON, Province of Bataan, Limay, *For. Bur. 12395 Curran & Merritt*, Aug. 1908.

It has been suggested that this form might be a natural hybrid of *D. grandiflorus* and *D. vernicifluus*. I think it a new species, but the material is not in condition to warrant describing it as such. The material consists of two young seedlings, three mature fruits and one adult leaf, picked up under the tree.

DRYOBALANOPS Gaertn.

According to Vidal, "Sinopsis de plantas leñosas de Filipinas," p. 48, *Dryobalanops aromatica* Gaertn. f. is probably found on Balabac and other Philippine Islands. Blanco in his second edition, p. 315, says that, according to some authors, this genus occurs in the Philippines.

I have been unable to find any definite record of the finding of *Dryobalanops* in the islands and so it is not considered here. It seems reasonable to suppose that it may some day be found in the southern part of the Archipelago, where there seem to be a good many Bornean forms.

2. ANISOPTERA Korthals.

Always large trees, with good clear length of bole, often gregarious. Bark thick, gray or blackish, coarsely furrowed and fissured. Wood yellowish or pinkish, without deposits of hard resin. Freshly cut stumps flowing a considerable quantity of a sticky wood oil. Leaves with a limited number of very prominent secondary nerves (14 to 20), usually chartaceous or thinly coriaceous. Stipules small, early deciduous. Flowers numerous, in lax panicles. Calyx-tube enclosing the fruit, which is connate with it; 2 lobes expanding into long wings which have three or four principal veins and numerous prominent transverse veins. Stamens 20 to 35; connective prolonged into a long point. Ovary with a large fleshy stylopodium, style short, with 3 stigmas. Young shoots, inflorescence, and underside of leaves clothed with fascicles of stellate hairs and minute round scales. The occurrence of these hairs and scales is very inconstant. The scales are present in all cases, though there may be but a few in some cases. The stellate hairs, on the other hand, are frequently wanting and their place may be taken by roughened scurfy patches along the under surface of the veins.

In the circumference of the pith there are 18 to 24 resin-ducts, often large and close together. In the petiole, the outer row of 7 to 13 vascular bundles forms a closed line, each one containing a resin-duct. In the center is a mass of vascular tissue which is relatively free from resin-ducts.

Wood white, yellowish or pinkish, no distinction between heartwood and sapwood except a slightly darker color in the heart. No distinct rings of seasonal growth. Slightly resinous odor when fresh, a sour and disagreeable odor if the wood has been left standing in a wet place for some time. A wood oil is present in the wood and the vessels containing it have often been mistaken for resin ducts. The oil can be secured as in *Dipterocarpus* though it is not commonly collected. It solidifies quickly into a more or less whitish resin. Pith-rays of two sorts, moderately broad and fine. Vessels of medium size. Wood parenchyma not prominent. Wood from young trees coarse-grained, brittle, rather difficult to work. Wood from mature trees of very good quality and seems to be fairly durable, being used for planks, crossbeams, etc.

There may be a definite period of leaf-fall; but, it is not as pronounced as in *Dipterocarpus*. The seeds germinate rather quickly after falling to the ground. The fruit is starchy and does not last long. This may be due to decay or to destruction by insects or other animals. The young seedlings do well in the shade. The flowers are borne in great quantity and are yellow. The flowering period for an individual tree is said to be not more than one month in length. The flowers are sometimes distinctly fragrant.

There are about fifteen species in the genus. Heretofore, no Philippine species has been credited to any region outside the Archipelago. It is, however, sufficiently apparent that our *Anisoptera thurifera* occurs in the Malay Peninsula, where it is usually identified as *A. glabra*, and *A. curtisii* is here reported for the first time from these Islands. This makes *A. curtisii* the most widely distributed member of the genus.

This genus in the Philippines gives the extreme northeastern range of the family. It also occurs almost as far north in the Philippines as it does in Burma.

1. **Anisoptera brunnea** sp. nov. Plate XI.

Arbor magna. Folia oblanceolata vel elliptica, coriacea, superne glabra, infra tomentosa, brunnea; lamina 6 ad 12 cm longa, 3.5 and 5.5 cm lata, nervis secundariis utrinque 12 ad 15; petiolo 2 ad 4.5 cm longo.

Fructus globosus 1 ad 1.5 cm diametro, tubo calycino apice valde constricto, calycis segmentis 2 majoribus oblanceolatis 5 ad 8 cm longis, 6 ad 10 mm latis, 3 minoribus linearibus 1–3-nerviis, scabris.

The conspicuous thing about this species is the chocolate brown tomentose under surface of the leaves and the large globose fruits, which are also chocolate brown. The leaves are oblanceolate or elliptic, more or less blunt or rounded at apex and base, and the margins slightly inrolled. Secondary nerves 12 to 15 pairs with intermediate shorter nerves which join the reticulate tertiary ones. Secondary and some of the tertiary nerves more or less uniting to form intra-marginal veins. Petioles 2 to 4.5 cm long, rather slender, thickened in upper one-fourth of their length. Fruit globose, scurfy, dark-brown. The two long wings somewhat pubescent, with three or four principal nerves and numerous secondary nerves which are transverse or oblique and reticulate. The three shorter wings linear, one- to three-nerved, somewhat scurfy like the fruit.

Differs from *A. curtisii* in size, shape and color of fruit and in color of tomentum. The last feature makes it very distinct in appearance from *A. thurifera*.

We have this species, thus far, only from the provinces of Cagayan and Ilocos Norte. The type was collected in the neighbhorhood of Camalamaiungan where it is said to grow in dense flat forest near sea level.

LUZON, Province of Cagayan, *For. Bur. 11292 Klemme*, April 1908, in fruit (type), *For. Bur. 4292 Klemme*, June 1906, in fruit, *For. Bur. 17230, 17300 Curran, For. Bur. 13128 Bernardo*, May 1909, in flower: Province of Ilocos Norte, *For. Bur. 14001, 14018 Merritt & Darling.*

Native name: *afu* (Cag.).

2. **Anisoptera curtisii** Dyer ex King in Journ. Asiat. Soc. Beng. **62** ^{2} (1893) 100; Brandis & Gilg in Engler & Prantl Nat. Pflanzenfam. **3** ^{6} (1895) *t. 122. F;* Brandis in Journ. Linn. Soc. Bot. **31** (1895) 42; Whitford in Philip. For. Bur. Bull. **10** ^{2} (1911) 78. Plate XLI.

Large tree 25 to 35 m tall, young branches slender, minutely scurfy-tomentose. Leaves oblong, tapering to both ends, the apex subacute or acute, the base narrowed but rounded; the upper surface glabrous, shining, the lower densely ochraceous-lepidote and sparsely stellate-pubescent, length 5 to 8.75 cm, breadth 1.9 to 3.1 cm, petiole 1.25 to 1.9 cm long; secondary nerves 18 to 20 pairs, spreading; accrescent calyx-lobes 8.75 to 11.25 cm long, linear-spatulate, 3-nerved, the transverse veins bold and numerous.

The most noticeable feature of this species is the brilliantly yellow lower surface of the leaves, the color being due to the very numerous small round scales with which the under surface is clothed. These scales are apparently of the same kind as those of *A. brunnea,* but here they impart a yellow color to the leaf. The freshly matured fruit has a pale-greenish-yellow color. The bark of mature trees is fissured, grayish in color, distinctly lighter-colored than that of *A. thurifera*. The wood seems to be the same in the two species, and the occurrence of a fluid resin or oil on freshly cut stumps seems also to be the same in both species.

The variety *latifolia* King, l. c., has been described, with leaves broadly elliptic, blunt, the bases rounded but narrowed, but I have found leaves both of this form and of the form of the type on the same tree and, therefore, do not consider the variety well founded.

LUZON, Province of Nueva Ecija, *For. Bur. 22184 Alvarez* (this number has small leaves with only 14 to 16 pairs of secondary nerves and a petiole which is proportionately longer than that of the type, but it seems best to include it here): Province of La Laguna, *Bur. Sci. 8985 Foxworthy*, July 1909, in fruit, *For. Bur. 15353 Tamesis:* Province of Camarines, *For. Bur. 10700 Curran*, June 1908, in fruit, *For. Bur. 13358 Aguilar*, July 1909, in fruit, *For. Bur. 12809 Rosenbluth, For. Bur. 18723 Darling*. POLILLO, *For. Bur. 3218 Hagger*, July 1905, in fruit. Native name: *dagang* (Tag.).

Distribution: Penang; Perak; Borneo, Lawas River; the Philippines.

3. **Anisoptera thurifera** (Blanco) Blume Mus. Bot. Lugd.-Bat. **2** (1856) 42; Vidal Sinopsis Atlas (1883) xv, *t. 14, f. E;* Brandis in Journ. Linn. Soc. Bot. **31** (1895) 44; Merr. & Rolfe in Philip. Journ. Sci. **3** (1908) Bot. 115; Foxworthy in Philip. Journ. Sci. **2** (1907) 389, **4** (1909) 512, *Pl. XXVIII, f. 74;* Brandis & Gilg in Engler & Prantl Nat. Pflanzenfam. **3**^{6} (1895) 258; Merritt in Philip. Bur. For. Bull. **8** (1908) 48; Whitford in Philip. Journ. Sci. **4** (1910) Bot. 703, Philip. Bur. For. Bull. **10**^{2} (1911) 78, *pls. 82, 83.*

Mocanera thurifera Blanco Fl. Filip. (1837) 446; Merr. in Bur. Govt. Lab. Publ. (Philip.) **27** (1905) 22.

Mocanera mayapis Blanco l. c. 449.

Dipterocarpus thurifer Blanco l. c. ed. 2 (1845) 310; ed. 3, **2** (1878) 212, *t. 264;* F.-Vill. Noviss. App. (1880) 20.

D. mayapis Blanco l. c. ed. 2 (1845) 313; Merr. in Bur. Govt. Lab. Publ. (Philip.) **27** (1905) 21.

Antherotriche lanceolata Turcz. in Bull. Soc. Nat. Moscou **19**^{2} (1846) 506; Walpers Ann. **1** (1848) 113.

Anisoptera lanceolata Walp. ex A. DC. Prodr. **16**^{2} (1868) 616; Brandis & Gilg in Engler & Prantl Nat. Pflanzenfam. **3**^{6} (1895) *f. 122 D, E;* Vidal Phan. Cuming. Philip. (1885) 97; F.-Vill. Noviss. App. (1880) 20.

Shorea mayapis Blume Mus. Bot. Lugd.-Bat. **2** (1856) 33.

Anisoptera oblonga F.-Vill. Noviss. App. (1880) 20; Vidal Rev. Pl. Vasc. Filip. (1886) 60; Ceron Cat. Pl. Herb. (1892) 25, non Dyer in Hook. f. Fl. Br. Ind. **1** (1874) 301.

Anisoptera vidaliana Brandis in Journ. Linn. Soc. Bot. **31** (1895) 44; Merr. in Philip. Journ. Sci. **1** (1906) Suppl. 97; Perk. Frag. Fl. Philip. (1904) 23.

Anisoptera tomentosa Brandis l. c.

Anisoptera calophylla Perk. l. c. 22.

Large trees with clean straight boles and thick, coarsely fissured, black or dark-gray bark. Leaves varying from thinly membranaceous to fairly stiff, but never thickly coriaceous, clothed below with fine round scales, which may be remote or closely crowded. The secondary and tertiary veins are sometimes irregularly scurfy. Large, branched stellate hairs are often present on the veins, but their occurrence seems to be very irregular. Leaves elliptic, shortly acuminate, on long petioles; blade 8 to 13 cm long, 4 to 7 cm wide, petioles 3 to 4 cm long; secondary veins 10 to 16 pairs, alternating with shorter intermediate veins. Tertiary veins parallel, joined by closely reticulate veins. Flowers in drooping panicles; pedicels less than one-half the length of the calyx, each flower supported by two, oblong, somewhat unequal, 1- to 5-nerved bracteoles. Anthers glabrous, the awn longer than the anther. Stylopodium bell-shaped, pubescent, sometimes slightly constricted above the ovary. Fruit globose, not much constricted at top, 4 to 15 mm in diameter; calyx-wings 5 to 9 cm long and sometimes more than 1 cm broad, with three prominent longitudinal veins and numerous, more or less oblique, transverse veins.

A tree of the lowland forest, ascending to 600 to 750 m above sea level.

It is possible that I am here retaining more than one distinct species under the name of *A. thurifera;* but, Merrill & Rolfe, l. c., have suggested their probable identity and I am unable now definitely to designate distinctive characters for different species. It will take a good deal of field work to clear up this matter. There do seem to be two definite types of fruit, one of which is rather large, globose, 1 to 1.5 cm in diameter with wings 5 to 7 cm long and more than 1 cm broad, the other with smaller globose fruit, 4 to 8 mm, and longer and narrower wings. I have not been able to discover any constant leaf differences. It may be that the same tree will produce both kinds of fruit; but we do not know that to be the case.

Some of the Malay Peninsula material which is identified as *A. glabra* certainly belongs to *A. thurifera.* In the incomplete state of our knowledge of these two species, I should hesitate to say whether or not the two are identical, but it is certain that *A. thurifera* does occur on the Malay Peninsula.

This species has been found in the Philippines as follows:

LUZON, Province of Cagayan, *For. Bur. 14736 Darling:* Province of Ilocos Norte, *For. Bur. 13998, 14004 Merritt & Darling:* Province of Ilocos Sur, *For. Bur. 5644 Klemme, For. Bur. 7111 Klemme,* April 1907, in flower: Province of Abra, *For. Bur. 14517, 14557, 14558 14621 Darling:* Province of Pangasinan, *For. Bur. 8287 Curran & Merritt, For. Bur. 13455 Medina, For. Bur. 14365 Villamil:* Province of Nueva Vizcaya, *For. Bur. 10902 Curran, For. Bur. 14860 Darling:* Province of Nueva Ecija, *For. Bur. 8481 Curran, For. Bur. 22183 Alvarez:* Province of Tarlac, *Vidal 87:* Province of Zambales, *Merrill 1763 Garcia,* Feb. 1903, in fruit, *Merrill 1749 Garcia,* April 1903, in fruit, *Merrill 2935 Irey,* May 1903, in fruit, *For. Bur. 3228 Maule,* Nov. 1904, in fruit, *For. Bur. 5814, 5877, 7016 Curran, For. Bur. 8418 Curran & Merritt, For. Bur. 19467 Agama:* Province of Bataan, *Merrill 1518* (type number of *A. calophylla* Perk.), *1475 Garcia,* Jan. 1903, in fruit, *Merrill 3154,* Oct. 1903, in fruit, *For. Bur. 488, 593*

Barnes, For. Bur. 743, 707 Borden, May 1904, in flower, *For. Bur. 1317, 1322, 1409, 1527, 1641, 1667, 1675 Borden, For. Bur. 1616, 1632, 1633, 1635, 1637, 1638, 1643, 1647, 1649, 1657, 1658, 1788, 1789 Borden*, Aug. 1904, in fruit, *For. Bur. 2128 Borden*, Dec. 1904, in fruit, *For. Bur. 2256 Meyer*, Dec. 1904, in fruit, *Whitford 352*, June 1904, in flower, *Whitford 1223*, April 1905, in fruit, *Whitford 1365, For. Bur. 1485 Ahern's coll.*, July 1904, in fruit, *Bur. Sci. 1627 Foxworthy, For. Bur. 5282, 5945, 7225 Curran:* Province of Bulacan, *Bur. Sci. 12273 Foxworthy:* Province of Rizal, *Vidal 73, 83, 85, 86, 651, 1167, 2168, Merrill 1027 Ramos*, Mar. 1903, in fruit, *Merrill 2803 Ramos*, July 1903, in fruit, *For. Bur. 471 Ahern's coll.*, April 1904, in flower, *Dec. Phil. For. Fl. 103 Ahern's coll.*, May 1904, in flower, *Loher 5600*, Apr. 1904 (fls. yellowish, sweet-scented), *Bur. Sci. 1463, 2168 Ramos, For. Bur. 2985 Ahern's coll.*, Apr. 1905, in flower, *For. Bur. 10005, 10006, 10019 Curran;* Province of La Laguna, *For. Bur 10107, 10152 Curran:* Province of Camarines, *For. Bur. 10761 Curran:* Province of Albay, *Cuming 882*, in flower, *For. Bur. 10609, 10617 Curran, For. Bur. 15067 Rosenbluth.* TICAO, *For. Bur. 12554 Rosenbluth.* MASBATE, *Merrill 2766 Barnes*, June 1903, in flower, *Whitford 1692.* MINDORO, *For. Bur. 11389, 11401, 11408 Merritt.* CEBU, *Vidal 2165.* MINDANAO, Zamboanga Peninsula, *For. Bur. 9135, 9371 Whitford & Hutchinson.* The last two numbers may belong to a distinct species. The leaves are larger and more membranaceous and the tertiary veins much more prominent than is usually the case in *A. thurifera.* Our material for these two numbers is not sufficiently complete to warrant separating them from the common species at the present time.

The field notes with our herbarium specimens seem to indicate that the time of flowering for this species is during the months of April, May, and June and the time of fruiting during the months of January, February, March, April, May, July, August, October, November, and December. Blanco, l. c., states that this species flowers and fruits in the month of June, in the mountains of San Mateo. He also states that a hard whitish resin, which is used for incense in some of the churches, is obtained from this species. The correctness of this statement seems very doubtful, as we have not found this species to produce such a resin. There is also confusion regarding Blanco's use of common names for this species. He gives the names of *lauaan* and *sandana*, which we have found to apply to other species. We have found the following native names used for this species: *mayapis* (Tag.); *palosapis* (Tag.); *dagum* (Tag.); *dagang na puti* (Tag.); *guyong* or *duyong* (Iloc.); *letis* (Mas.).

4. **Anisoptera** sp.

This form is as nearly as possible intermediate between *A. thurifera* and *A. curtisii.* The habit of the tree and the appearance of many of the mature leaves is that of *A. thurifera.* The young leaves look like those of *A. curtisii* and the fruits also resemble those of that species. In some of the examples listed under *A. thurifera,* the fruit is small and it is difficult to tell whether it is really immature *A. thurifera* or this form.

This form has been found in the provinces of Bataan and Zambales and is represented by the following:

Province of Bataan, *For. Bur. 1377, 1381, 1390, 1407 Borden*, July 1904, with young fruit, *For. Bur. 1792 Borden.* Sept. 1904, in fruit, *For. Bur. 12921, 12923 Alvarez*, Aug. 1909, in fruit, *For. Bur. 17515 Curran*, Dec. 1909, in fruit: Province of Zambales, *For. Bur. 6974 Curran.*

3. HOPEA Roxb.

Stipules minute or small, early deciduous. Flowers almost always in unilateral spikes or racemes, these generally in racemose, rarely compound panicles. Calyx often glabrous, but petals always hairy outside. Calyx-segments imbricate, the two outer ones in the flower generally much larger than the others; growing into thin membranaceous wings, as the fruit ripens. Stamens 15, 10 in a few species (*H. plagata* is said to have more than 30 stamens); anther-cells equal; connective prolonged into a long awn. Stylopodium in most species large, in some wanting, but generally indicated by a ring of hairs.

In most cases the cotyledons are thick-fleshy, the outer rounded surface longitudinally channelled; both bifid to the point of attachment of the hypocotyl. The outer or radicular cotyledon generally more or less concave, embracing the inner or placentar cotyledon. Hypocotyl and petioles of cotyledon half as long or as long as the seed, generally hairy, except the glabrous shining tip, imbedded on the outside of the embryo in a groove between the lobes of the outer cotyledon, while the lignified placenta with the remains of the dissepiments intrudes between the lobes of the inner. There are variations from this type in a number of species, but I have not had an opportunity to see them.

There is said to be a great deal of variation in anatomical structure in the genus, but the difficulties in getting sufficient material of most of the species have been such that I have been unable to carry out any complete comparative study for the genus.

The bark is usually fissured and dark-brown or black. Where the color is brown, the bark is usually thin, where it is black, there is thick bark. The inner layers of the bark are usually yellow with a brownish tinge.

The wood is pale-yellow or straw-color in the sap and the heart has a brownish color. This seems to be true of our species so far as known. The wood structure is difficult to distinguish from that of *Vatica* or of some species of *Shorea.*

The genus has about fifty species, 11 species being found in the Philippines.

The resin of some species is used. It is a fair grade of gum dammar and is collected from *H. plagata.* It occurs similarly in *H. pierrei, H. acuminata,* and possibly other species.

The flowering and fruiting time of the different species is but little understood. It seems to be believed that *H. plagata* does not fruit every year, but the infrequent collections and the small size of the fruit might make it possible for such a belief to be common, even if the species were fruiting regularly every year. The fruits are small and rather fragile and, presumably, do not retain their vitality very long after falling from the tree.

KEY TO PHILIPPINE SPECIES OF HOPEA.

a. Secondary nerves few and prominent.
b. Leaves narrowly oblong.
c. Leaves bilaterally symmetrical or nearly so, 2–3 cm wide.. 5. *H.* sp. (Naric)
cc. Leaves unilatorally unsymmetrical.
d. Leaves 10 to 15 cm long, 2.2 to 7 cm wide; fruit less than 8 cm long.
e. Stipules long, semipersistent; fruit 6.5 to 7.5 cm long. 3. *H. philippinensis*
ee. Stipules short, fruit 3.5 to 4.3 cm long.................... 1. *H. basilanica*
dd. Leaves larger, fruit 8 cm or more in length............ .. 2. *H. mindanensis*
bb. Leaves not narrowly oblong.
c. Leaves broad, elliptic-oval.................................... 7. *H. ovalifolia*
cc. Leaves lanceolate.
d. Leaves 3 to 6 cm long, with few (5 to 7) pairs of secondary nerves. 6. *H.* sp. (Gyam)
dd. Leaves larger.
e. Leaves long-acuminate, usually without domatia.......... 8. *H. acuminata*
ee. Leaves not long-acuminate, domatia prominent.............. 4. *H. plagata*
aa. Secondary nerves not distant; leaves coriaceous, glabrous, with numerous indistinct and almost parallel nerves.
b. Fruit more than 1 cm long.. 11. *H.* sp.
bb. Fruit less than 1 cm long.
c. Fruit reddish-brown, leaves with domatia.......................... 9. *H. pierrei*
cc. Fruit greenish, leaves without domatia.............................. 10. *H.* sp.

Sect. I. EUHOPEA. Secondary nerves conspicuous, not approximate, not more than 20 pairs. Stamens 15, sometimes 12 to 15. Stylopodium always large.

It seems that most of our species belong in this section. Two undetermined species are placed here at a venture, it seeming more probable that they will go here than in the section *Petalandra*.

1. Hopea basilanica sp. nov. Plate XLII.

Arbor magna; foliis chartaceis, anguste oblongis vel ellipticis, glabris, supra nitidis, 10 ad 15 cm longis, 2.2 ad 4.8 cm latis, brevissime caudato-acuminatis, basi paullo obliquis, obtusis, utrinque glaberrimis, costa media utrinque nervis lateralibus subtus prominentibus; petiolo brevissimo; paniculis brevibus terminalibus vel lateralibus; floribus ....; fructu majusculo, calyce accreto cincto; calycis fructiferi lobi aucti 3.5 ad 4.3 cm longi, latitudine fere 10 ad 15 mm.

Large tree 18 m tall, with thick, black, furrowed bark, like that of *H. acuminata.* Leaves chartaceous, narrowly oblong or elliptic, glabrous, shining above, 10 to 15 cm long, 2.2 to 4.8 cm wide. Apex acuminate, tapering and unsymmetrical at base, the part above the midrib being the larger. Petiole dark-colored and wrinkled, when dry. Midrib slightly pubescent above; secondary nerves 10 to 12 pairs, ascending and bent upward at the margin of the leaf. Domatia in the axils of at least the lowest pairs of veins. Tertiary veins parallel and reticulate. Inflorescence axillary in few-flowered racemose panicles. Occasionally two inflorescences from one axil. Rachis of inflorescence brownish pubescent. Fruit 3 to 4 mm in diameter, 4 to 5 mm long; resin-cavities in lower part of fruit. Fruiting calyx with 2 long wings 3.5 to 4.3 cm long and 10 to 15 mm wide, with about 9 principal veins. Wings yellow when dry, the veins being of darker color and the fruit and base of wings very dark-brown. The bases of these two larger wings are expanded so as practically to conceal the small wings.

Differs from *H. odorata* in shape of leaves and in its thick short petioles, in size of fruit and in expanded bases of the two enlarged calyx wings; from *H. plagata* in its narrower leaves, shorter petioles, smaller fruit, with expanded bases to calyx wings; from *H. philippinensis* in fruit and the absence of the long stipules.

BASILAN, *For. Bur. 15220 Klemme*, Aug. 1910; *For. Bur. 15408 Pray*.

Common name: *dalindingan*.

2. **Hopea mindanensis** sp. nov. Plate XLIII.

Arbor magna, 12 ad 15 m alta, 25 cm diam.; foliis anguste oblongis, brevissime acuminatis, basi irregulariter cordatis, auriculatis, costa media utrinque nervis lateralibus subtus prominentibus; lamina 15 ad 35 cm longa, 6 ad 11 cm lata, nervis lateralibus 18 ad 24; petiolo brevissimo (5 ad 15 mm), pubescente. Fructu majusculo calyce accreto cincto; calycis lobis majoribus basi ovato tumido, limbo late spathulato, apice rotundato, basim versus valde attenuato, nervis 7 percurso.

MINDANAO, District of Zamboanga, *For. Bur. 9029 Whitford & Hutchinson* (type). Also represented by *For. Bur. 9376 Whitford & Hutchinson*, Jan. 1908, *For. Bur. 9436*, Feb. 1908, all three numbers from the same locality.

This species differs from *H. philippinensis* in the larger size of leaves and fruit, the pubescent petioles and the auriculate leaf-bases.

Common name: *magasusu*.

3. **Hopea philippinensis** Dyer in Journ. Bot. **16** (1878) 100; Vidal in Rev. Pl. Vasc. Filip. (1886) 62; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 64; Everett & Whitford in Philip. Bur. For. Bull. **5** (1906) 16, 28, 53; Foxworthy in Philip. Journ. Sci. **4** (1909) Bot. 515; Whitford in Philip. Bur. For. Bull. **10^{2}** (1911) 75, *pl. 79*.

A medium-sized tree with thin, dark-colored bark. Leaves thinly coriaceous, narrowly oblong, caudate-acuminate, base very unequal-sided, obtuse and almost glabrous, midrib and the 17 to 22 pairs of secondary nerves prominent beneath; domatia conspicuous; leaf-blade 10 to 15 cm long, 3 to 5 cm wide; petiole very short, 6.5 mm long, black and wrinkled. Panicle rather short, terminal or lateral, usually appearing from the branches below the leaves, i. e., from the axils of fallen leaves. Fruits with two, long, spathulate calyx-lobes, 6.5 to 7.5 cm long and 2 cm wide, very much narrowed toward the base. Fruit red when fresh, sometimes becoming chocolate-color on drying.

Probably the most prominent feature in the fresh material is the linear-lanceolate acute stipules, 2 to 3.5 cm long, some of which persist in the dried material.

LUZON, Province of La Laguna, *For. Bur. 17650 Curran*, Feb. 1910, in flower: Province of Tayabas, *For. Bur. 10194, 10376 Curran*, *For. Bur. 10389 Curran*, May 1908, in fruit, *For. Bur. 11503 Whitford*, *For. Bur. 12516 Rosenbluth*, *For. Bur. 14939, 18636, 18662 Darling*, *For. Bur. 23017 Aguilar:* Province of Camarines, *For. Bur. 10705 Curran:* Province of Albay, *Cuming 879*, in fruit, *For. Bur. 10578, 10619 Curran*. LEYTE, *For. Bur. 12738 Rosenbluth*. Mar. 1909, in flower. NEGROS, Province of Negros Occidental, *For. Bur. 7270 Everett*, May 1907, in fruit, *For. Bur. 7298 Everett*, April 1907, in fruit, *For. Bur. 13757 Foxworthy*, *For. Bur. 15030 Danao*, Mar. 1908, in fruit, *For. Bur. 17357, 17492, 17496 Curran*. MINDANAO, Subprovince of Butuan, *For. Bur. 7588 Hutchinson*.

Native names: *guisoc-guisoc* (V.), *manguitarem* (Tag., B.), *paina* (B.).

4. **Hopea plagata** (Blanco) Vidal Rev. Pl. Vasc. Filip. (1886) 62; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 64; Foxworthy in Philip. Journ. Sci. **2** (1907) Bot. 396, **4** (1909) Bot. 515; Merritt in Philip. Bur. For. Bull. **8** (1908) 48; Whitford in Philip. Journ. Sci. **4** (1910) Bot. 715, in Philip. Bur. For. Bull. **10**^{2} (1911) 73, *pls. 76, 77*.

Mocanera plagata Blanco Fl. Filip. ed. 1 (1837) 447.

Dipterocarpus plagatus Blanco Fl. Filip. ed. 2 (1845) 311.

Anisoptera plagata Blume Mus. Bot. Lugd.-Bat. **2** (1856) 42; A. DC. Prodr. **16**^{2} (1868) 616.

Shorea reticulata F.-Vill. Noviss. App. 21, non Dyer in Hook. f. Fl. Brit. Ind. **1** (1874) 307.

Hopea odorata var.? Vidal Sinopsis Atlas (1883) xv, *t. 15, f. A, 1–4*.

Large trees with thick, fissured, black bark. Leaves chartaceous or thinly coriaceous, glabrous, lanceolate, 8 to 12 cm long, 3 to 5 cm wide, entire, apex acuminate, base cuneate; secondary nerves 8 to 12 pairs, with domatia in their axils on under side of leaf; petiole 1.5 to 2.5 cm long. Young leaves are distinctly viscid. I have not seen the species in flower. Blanco says that there are more than 30 stamens and no style. Fruit conical, 12 to 13 mm long, 5 to 6 mm in diameter, smooth, shining, brown, with 2 long calyx-lobes, 3 to 3.5 cm long and 7 to 9 mm wide, oblanceolate and often more or less irregular, with about 8 principal veins; the three smaller calyx-lobes overlapping, blunt or acute at the apex and less than half the length of the fruit.

LUZON, Province of Cagayan, *For. Bur. 17240, 17299 Curran:* Province of Ilocos Norte, *For. Bur. 13052 Paraiso:* Province of Nueva Vizcaya, *For. Bur. 18403 Alvarez:* Province of Nueva Ecija, *Vidal 84*, *For. Bur. 8429 Curran*, *For. Bur. 14308 Saroca:* Province of Pangasinan, *For. Bur. 8292 Curran & Merritt*, *For. Bur. 12981 Alvarez*, *For. Bur. 13492, 13523 Medina*, *For. Bur. 14360 Villamil:* Province of Zambales, *For. Bur. 5905, 5919, 6928, 6930 Curran*, *For. Bur. 6017 Aguilar*, *For. Bur. 8122, 8124 Curran & Merritt*, *For. Bur. 11043 Zschokke*, *For. Bur. 13200 Cortes:* Province of Bataan, *For. Bur. 17625 Curran* (this specimen is very fragmentary and of doubtful determination): Province of Bulacan, *For. Bur. 11151 Aguilar*, *Bur. Sci. 12270 Foxworthy:* Province of Tayabas, *For. Bur. 4531 Kobbe*, June 1906, in fruit, *For. Bur. 11515 Whitford*, *For. Bur. 22167 Alvarez:* Province of Sorsogon, *For. Bur. 10623 Curran*. MINDORO, *For. Bur.*

12028 Merritt. MINDANAO, District of Zamboanga, *For. Bur. 6565, 9496 Hutchinson, For. Bur. 9040, 9289 Whitford & Hutchinson.* BASILAN, *For. Bur. 12369 Hutchinson.*

Many of our specimens are fragmentary and it is quite possible that there may be more than one species in the material cited above.

The following numbers seem to belong to what Whitford[12] calls *black yacal.* The chief apparent difference in herbarium material seems to be that the leaves are a little broader and, perhaps, more inclined to be coriaceous. In drying, the leaves turn very dark and are more or less covered above with a glaucescence.

LUZON, Province of Pangasinan, *For. Bur. 19445 Agama:* Province of Zambales, *For. Bur. 13201, 13202 Cortes.* MINDANAO, District of Zamboanga, *For. Bur. 9004 Whitford & Hutchinson.*

This species produces a resin or gum dammar, which is sometimes collected by the natives and used for torches.

The flowering time of this species is not understood. Blanco, l. c., says that it flowers only in the month of March. In some sections, the people claim that it flowers only once in five or seven years.

Native names: *yacal* (Tag.), *saplongan* (Tag.), *siggay* (Cag.), *betic* (Il.), *guisoo* (B., V., Moro), *taggai* (Il.).

5. **Hopea** sp. "Naric."

Leaves narrowly oblong, 5 to 10 cm long, 16 to 26 mm wide, apex long-caudate-acuminate, base rounded, secondary nerves 10 to 12 pairs, with domatia in their axils. Petiole 3 to 5 mm long. Stipules early deciduous.

LUZON, Province of Cagayan, *For. Bur. 6497, 13414 Klemme.* The following two numbers probably do not belong here; but, I do not know where else to place them. LUZON, Province of Bataan, *For. Bur. 589 Barnes,* Mar. 1904. MINDANAO, District of Zamboanga, *For. Bur. 9404 Whitford & Hutchinson,* Feb. 1908.

6. **Hopea** sp. "Gyam."

This large tree seems to be the same as that which occurs under the same name in the eastern part of British North Borneo. The bark is thin and brownish. The wood is a very heavy and very hard *yacal.*

A tree of rather gregarious habit, growing on low flat lands near the coast. The leaves are elliptic or elliptic-lanceolate or narrowly oblong, 3 to 6 cm long and 1.5 to 2 cm wide, apex bluntly caudate-acuminate, base cuneate; secondary nerves 5 to 7 pairs, with very large domatia in their axils on the under side. Perhaps the most distinct species which we have in the genus.

A single sterile specimen from Tawi Tawi, *For. Bur. 13380,* collected by *W. Schück,* June, 1910.

7. **Hopea ovalifolia** Boerl. in Cat. Hort. Bot. Bog. 1 (1899) 102.

The description of this species is very meager and is from sterile material; but we have a sheet from the garden at Buitenzorg, determined by Dr. Boerlage as this species and it seems to correspond quite closely to a collection of ours, also sterile.

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[12] Philip. Bur. For. Bull. 10² (1911) 73.

Leaves oval 12 to 18 cm long, 7 to 10 cm wide, shortly acuminate, secondary nerves about 12 arcuate-ascending, rather prominent on under side of leaf, the younger parts minutely lepidote.

MINDANAO, District of Zamboanga, *For. Bur. 9133, 9374 Whitford & Hutchinson*, Dec. 1907, Jan. 1908.

Sect. II. PETALANDRA Hassk. (genus).

Secondary nerves conspicuous, not approximate, not more than 20 pairs; tertiary nerves generally parallel, approximate, but not conspicuous. Stamens 10, on broad short filaments, which are sometimes monadelphous. Stylopodium either wanting, or a fleshy rim or tube on the top of the truncated ovary.

The only Philippine species which we know to belong to this section is the following.

8. **Hopea acuminata** Merr. in Bur. Govt. Lab. Publ. (Philip.) **29** (1905) 30; Philip. Journ. Sci. **1** (1906) Suppl. 98; Foxworthy in Philip. Journ. Sci. **2** (1907) Bot. 389, **4** (1909) Bot. 514, *pl. 27, f. 68;* Whitford in Philip. Journ. Sci. **4** (1910) Bot. 703, Philip. Bur. For. Bull. **10**^{3} (1911) 75, *pl. 80*.

A tree reaching a height of 40 m, with broadly lanceolate, narrowly acuminate, glabrous leaves, 8 cm long or less, and small flowers in unilateral racemes, which are arranged in terminal and axillary panicles. Branches nearly black when dry, glabrous, striate. Leaves 4 to 8 cm long, 2 to 3 cm wide, submembranaceous, shining above, the base inequilateral, rounded at least on one side of the lamina, the apex long-slender-acuminate; nerves 8 to 10 pairs, rather prominent beneath; petioles 5 to 8 mm long, rugose, glabrous. Inflorescence grayish-stellate-pubescent, the panicles 5 to 6 cm long or less, the spicate branches 1.5 cm long or less. Calyx rusty-pubescent, the sepals 5, imbricate, the outer two slightly larger than the inner. Petals slightly pubescent on the outside, falcate, 4 mm long, 1.8 mm wide, obtuse. Stamens 10; filaments thick; anthers 0.4 mm long, the single appendage slender, equaling the anther in length. Ovary glabrous, 3-celled, each cell 2-ovuled; style short; stylopodium none. Fruit glabrous, the two wings oblong, about 2 cm long, 5 mm wide, the apex rounded.

A tall tree, with a slender, straight trunk, growing in the hill forests from an altitude of 100 to about 800 m above the sea.

LUZON, Province of Cagayan, *For. Bur. 17209 Curran:* Province of Ilocos Norte, *For. Bur. 13869, 13874 Merritt & Darling:* Province of Nueva Vizcaya, *For. Bur. 10887 Curran, For. Bur. 18028 Merritt:* Province of La Union, *For. Bur. 13002 Paraiso:* Province of Pangasinan, *For. Bur. 14357 Villamil:* Province of Tarlac, *For. Bur. 15405 Aguna:* Province of Nueva Ecija, *For. Bur. 22387, 22390 Alvarez:* Province of Bulacan, *Bur. Sci. 12269 Foxworthy:* Province of Bataan, *For. Bur. 786 Borden*, May 1904, in flower, (type), *Whitford 335*, May 1904, in flower, *For. Bur. 1175, 1245 Borden, For. Bur. 1592 Borden*, Aug. 1904, in fruit, *Merrill 3864*, Aug. 1904, in fruit, *Bur. Sci. 1563 Foxworthy, For. Bur. 7497, 17595 Curran,* *For. Bur. 7504 Curran*, Sept. 1907, in fruit: Province of La Laguna, *For. Bur. 10115 Curran*, *For. Bur. 12684 Rosenbluth & Tamesis*, *For. Bur. 11721 Whitford*, *For. Bur. 13349 Tamesis:* Province of Tayabas, *For. Bur. 7095 Kobbe*, May 1907, in flower, *For. Bur. 10385, 10390 Curran*, *For. Bur. 11510 Whitford*, *For. Bur. 18653 Darling*, *For. Bur. 23002 Aguilar:* Province of Camarines, *For. Bur. 4532 Barredo*, *For. Bur. 10459 Curran:* Province of Albay, *For. Bur. 15070 Rosenbluth:* Province of Sorsogon, *For. Bur. 4525 Zschokke*, *For. Bur. 5751 Pray*. MINDORO, *For. Bur. 7147 Merritt*. LEYTE, *For. Bur. 12728 Rosenbluth*. MINDANAO, Province of Misamis, *For. Bur. 15472 Pray:* District of Davao, *For. Bur. 11557 Whitford*.

Native names: *mangachapuy* (Tag.. V.), *dalindingan* (Tag.), *barosingsing* (Iloc.).

Sect. III. DRYOBALANOIDES. Secondary nerves numerous, approximate, not prominent, and often obscure. Stamens 15. Stylopodium in some species wanting, indicated by a hairy ring.

9. **Hopea pierrei** Hance in Journ. Bot. **15** (1877) 329; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 67, *pl. 2, f. 10;* Foxworthy in Philip. Journ. Sci. **4** (1909) Bot. 515; Whitford in Philip. Bur. For. Bull. **10**² (1911) 76.

H. micrantha Hance in Journ. Bot. **14** (1876) 242, non Hook. f. in Trans. Linn. Soc. **23** (1862) 161.

Hancea pierrei Pierre Fl. For. Cochinch. (1891) *t. 248*.

Medium-sized trees; branchlets glabrous, only petioles and ramifications of inflorescence slightly puberulous; small hairy glands (domatia) usually found in axils of secondary nerves. Flowers drooping, pedicellate, in unilateral racemes, these distichous and regularly alternating, forming short axillary racemose panicles. Bracteoles ciliate. Calyx glabrous; petals sericeous outside; awn of connective more than twice as long as the anther. Stylopodium glabrous as well as ovary, constricted below; style very short; stigma obtuse. Fruit ovoid, slightly acuminate, very tightly enclosed by the 5 calyx-segments which are indurated at the base. Both cotyledons bifid to base, the radicular somewhat larger; hypocotyl half the length of embryo, cotyledons filled with starch.

LUZON, Province of Cagayan, *For. Bur. 17075, 17206, 17256 Curran:* Province of Pangasinan, *For. Bur. 9638 Zschokke:* Province of Nueva Ecija, *Bur. Sci. 13072 Foxworthy*, *For. Bur. 22195 Alvarez:* Province of Zambales, *For. Bur. 8231 Curran & Merritt:* Province of La Laguna, *For. Bur. 10150, 10157 Curran*, *For. Bur. 15352 Tamesis*, *Bur. Sci. 8982 Foxworthy*, *For. Bur. 17638, 17645 Curran*, Feb. 1910, in fruit, *For. Bur. 22499, 22500 Mariano:* Province of Tayabas, *Whitford 792*, Sept. 1904, with young flowers, *For. Bur. 23018 Aguilar:* Province of Camarines, *For. Bur. 10719 Curran*, *For. Bur. 12810 Rosenbluth:* Province of Albay, *For. Bur. 10579, 10618 Curran:* Province of Sorsogon, *For. Bur. 10599, 10627 Curran*. POLILLO, *Bur. Sci. 10285 McGregor*. MINDORO, *For. Bur. 6726 Merritt*, April 1907, in flower, *For. Bur. 8742, 11399, 12027 Merritt*. NEGROS, Province of Negros Occidental, *For. Bur. 17365 Curran*.

Common names: *dalindingan isak* (Tag.), *malatagum* (B.), *makitarem* (Sor.), *lito* (Sor.), *mangachapuy* (T., V.), *pisak* (Cag.).

Distribution: Cambodia, Singapore, Borneo and the Philippines.

10. **Hopea** sp.

A form which differs from *H. pierrei* in having usually more uniform, smaller and narrower leaves and green, short-stalked fruit. The leaves seem to be without domatia.

It is possible that some of the sterile material which has been referred to *H. pierrei*, may belong to this species and the next.

A single collection from the Island of Sibuyan, *Elmer 12071*, March 1910, in fruit.

11. **Hopea** sp.

This differs from *H. pierrei* in having a much larger fruit, which is sometime glutinous.

SIBUYAN, *Elmer 12289*, April 1910, in fruit. LUZON, Province of La Laguna, *Phil. Pl. 897 Ramos*, August 1910, in fruit.

4. PENTACME A. DC.

Sepals strongly imbricate. Petals broad, spreading. Stamens 15. Anthers oblong, on short broad filaments. Anther-cells equal, each prolonged into a short appendix; the connective also prolonged, so that each anther has 5 apical appendages. Ovary glabrous, prolonged into a conical stylopodium; style filiform, glabrous. Stigma obtuse, indistinctly 3-toothed. The three outer segments of fruiting-calyx much larger than the others, narrowed into a stalk, but expanding into a broad base, which is adpressed to the lower portion of the fruit but does not enclose it.

Four species known, two from the eastern Indian peninsula and two from the Philippine Islands.

The wood is the least durable of any of our dipterocarps, but is considerably used because it is so abundant and readily worked and it is very satisfactory for purposes of temporary construction. There is quite a little resin present in the wood, but so far as I know, it is not used commercially.

Pith with 12 to 25 resin-canals. Petiole with a semicircle of 7 to 9 vascular bundles, each with one resin-canal; 3 resin-canals in the central mass.

1. **Pentacme contorta** (Vidal) Merrill & Rolfe in Phil. Journ. Sci. **3** (1908) Bot. 115; Merritt in Philip. Bur. For. Bull. **8** (1908) 48; Whitford in Philip. Journ. Sci. **4** (1910) Bot. 703, Philip. Bur. For. Bull. **10**² (1911) 62, *pls. 56, 57;* Foxworthy in Philip. Journ. Sci. **4** (1909) Bot. 511, 516.

Shorea contorta Vidal Sinopsis Atlas (1883) xv, *t. 15, f. E;* Rev. Pl. Vasc. Filip. (1886) 88; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 88; Merr. in Phil. Journ. Sci. **1** (1906) Suppl. 98; Foxworthy in Philip. Journ. Sci. **2** (1907) Bot. 386.

Pentacme paucinervis Brandis in Journ. Linn. Soc. Bot. **31** (1895) 73; Merrill & Rolfe in Phil. Journ. Sci. l. c.

Leaves glabrous, ovate, acuminate, margin undulate or entire; secondary nerves 6 pairs; tertiary nerves parallel, not conspicuous, joined by reticulate veins. Anthers linear; appendix of connective very short. Ovary glabrous; style cylindric, articulate with ovary, stigma minutely papillose. Wings of fruiting-calyx twisted, very unequal, the two largest 7 to 13 cm long, with 10 to 12 prominent nerves, the third 6.5 cm long, the others much smaller. Fruit tomentose, acuminate; base of fruiting-calyx pubescent. The number of secondary nerves is rather variable as is also the size of the fruit.

This is the commonest and most widely distributed species of the family in the Islands. It is probable that it occurs in every province.

LUZON, Province of Cagayan, *For. Bur. 7088 Klemme*, *For. Bur. 14726, 14734 Darling*, *For. Bur. 16930, 16963, 17163, 17186 Curran:* Province of Isabela, *For. Bur. 14840 Darling*, *For. Bur. 18557 Alvarez:* Province of Ilocos Norte, *For. Bur. 13823, 13854, 13923, 14002 Merritt & Darling:* Province of Ilocos Sur, *For. Bur. 14092 Merritt & Darling:* Province of Abra, *For. Bur. 14664 Darling:* District of Bontoc, *For. Bur. 17013 Curran:* Subprovince of Benguet, *For. Bur. 10804 Curran:* Province of Nueva Vizcaya, *For. Bur. 18411 Alvarez:* Province of Pangasinan, *For. Bur. 8282 Curran & Merritt*, *For. Bur. 14364 Villamil:* Province of Nueva Ecija, *For. Bur. 8493 Curran*, *Bur. Sci. 12297 Foxworthy*, *For. Bur. 22388 Alvarez:* Province of Tarlac, *Vidal 79:* Province of Bulacan, *For. Bur. 11152 Aguilar*, *Bur. Sci. 12293 Foxworthy:* Province of Zambales, *For. Bur. 5810, 5904, 6916 Curran*, *For. Bur. 19462 Agama:* Province of Bataan, *For. Bur. 504, 511, 519, 534, 536, 538, 605, 598, Barnes*, *Dec. Phil. For. Fl. 72 Barnes*, Jan. 1904, in flower, *For. Bur. 650, 653 Borden*, April 1904, in flower, *Whitford 293*, May 1904, in flower, *For. Bur. 677 Borden*, May 1904, in flower, *For. Bur. 821 Borden*, June 1904, with immature fruit, *For. Bur. 1748 Borden*, Aug. 1904, mature fruit, *Bur. Sci. 1555, 1626 Foxworthy*, *For. Bur. 5281, 5961, 17609 Curran*, *For. Bur. 6367 Curran*, Mar. 1907, in flower: Province of Rizal, *Vidal 987, 2167*, *Merrill 2697 Ramos*, June 1903, in flower, *For. Bur. 2970 Ahern's coll.*, Apr. 1905, in fruit, *For. Bur. 3199 Ahern's coll.*, July 1905, in flower, *Bur. Sci. 109 Foxworthy*, *Bur. Sci. 1464 Ramos*, *Bur. Sci. 3258 Ramos*, June 1907, in fruit, *For. Bur. 10009, 10036, 10042 bis Curran*, *Bur. Sci. 4635 Ramos:* Province of La Laguna, *For. Bur. 7902 Curran & Merritt*, *For. Bur. 22232 Mariano:* Province of Tayabas, *For. Bur. 6070 Kobbe*, *For. Bur. 10175, 10398 Curran*, *For. Bur. 11504 Whitford*, *For. Bur. 14990, 18690 Darling*, Oct., Dec. 1909, in fruit: Province of Camarines, *For. Bur. 10447, 10735 Curran*, *For. Bur. 10659 Curran*, June 1908, in flower, *For. Bur. 10721 Curran*, July 1908, in flower, *For. Bur. 13356 Aguilar*, *For. Bur. 14337 Aguilar*, July 1909, with immature fruit: Province of Albay, *For. Bur. 10593, 10615 Curran:* Province of Sorsogon, *For. Bur. 5168 Bridges*, *For. Bur. 10559 Curran*, June 1908, in flower. POLILLO, *For. Bur. 3217 Hagger*, July 1904, fruit, *Bur. Sci. 6831 Robinson*, Aug. 1909, fruit, *Bur. Sci. 10379 McGregor*. MARINDUQUE, *For. Bur. 12155 Rosenbluth*. MASBATE, *Merrill 2772 Barnes*, June 1903, in flower. MINDORO, *Whitford 1395*, *For. Bur. 4480 Merritt*, June 1906, in flower, *For. Bur. 9910 Merritt*, April 1908, immature fruit, *For. Bur. 8682, 12012 Merritt*. SAMAR, *For. Bur. 12853, 12651 Rosenbluth*. NEGROS, *For. Bur. 17349, 17417, 17487 Curran*, *For. Bur. 17367, 17432 Curran*, Sept. 1909, in fruit. MINDANAO, Subprovince of Agusan, *For. Bur. 7597 Hutchinson:* District of Davao, *For. Bur. 11564 Whitford:* District of Lanao, *Mrs. Cle-*

mens 247, Feb. 1906, in flower: District of Zamboanga, *For. Bur. 9042*, *9184 Whitford & Hutchinson*. BASILAN, *For. Bur. 4004 Hutchinson*, Feb. 1906, with immature fruit, *For. Bur. 4813 Hutchinson*, July 1906, fruit.

This species has been collected in flower in the months of January, February, March, April, May, June, and July, and in fruit in the months of February, April, June, July, August, September, October, and December.

Native names: *lauan* (Tag.), *balac* (Cag. Negrito), *apnit* (Cag., Iloc.), *balocbac* (Negrito), *malaanonan* (Tag.), *danlig* (V.).

2. **Pentacme** sp.

Leaves broadly oblong, shortly and abruptly acuminate, base rounded; stipules 2 to 3 cm long, 7 to 8 mm wide, lanceolate or oblanceolate; secondary nerves about 15 pairs. Young shoots, petioles and underside of leaves covered with a grayish tomentum. Wood soft and white, with much the same structure as that of *P. contorta* but finer-grained. Bark dark and fissured. A tree of the low flat forest near the beach.

LUZON, Province of Tayabas, *For. Bur. 10333 Curran*.

This form seems to show some points of resemblance to *Pentacme siamensis* Kurz.

5. SHOREA Roxb.

Large resinous trees; stipules in a few species large and persistent, in most small and early deciduous. Leaves chartaceous or coriaceous; secondary nerves prominent; tertiary nerves mostly parallel. Flowers as a rule in unilateral spikes or racemes, these distichous and regularly alternating on the branches of large axillary and terminal panicles. Each flower subtended by two, mostly deciduous, in a few species persistent and conspicuous, bracts. Sepals strongly imbricate, always hairy outside, and often inside also, on the margin of a broad obconical receptacle. Petals oblong, rarely ovate-oblong, hairy on the outside. Stamens generally 15, in some species more. Anther-cells generally equal; connective prolonged into a pointed appendage, generally longer than the anther, sometimes short or wanting. Segments of fruiting calyx with their broad bases tightly enclosing the fruit, the three outer ones generally longer than the others and much longer than the fruit.

Ripe seed generally without albumen. Cotyledons thick, fleshy, generally both bifid to their base, that is to the point where they are attached to the apex of the hypocotyl (radicle) or to the petioles.

Pith with 3 to 30 perimedullary resin-canals, with now small now wide lumen. The structure of the petiole is various; usually it shows the characteristic form; viz., a semicircle of 7 to 9 isolated vascular bundles with alternating resin-canals and a central bundle-system without resin-canals; in other species there is found a central bundle system with no or 1 to 3 resin-canals.

The largest genus in the family, with more than 90 species, with 14 species in the Philippines. Of our Philippine species four, *S. balangeran*, *S. eximia*, *S. squamata*, and *S. teysmanniana* are extra-Philippine in distribution.

KEY TO THE PHILIPPINE SPECIES OF SHOREA.

a. Leaves broadly ovate, thickly coriaceous, margins inrolled; wood soft and red. 13. *S.* sp.

aa. Not as above.

b. Leaves distinctly lighter-colored beneath.

c. Leaves grayish or yellowish, pubescent beneath; wood very hard, yellow or brownish .... 1. *S. balangeran*

cc. Not as above.

d. Leaves retuse at the apex, coriaceous, light-colored and almost glabrous beneath; wood light-colored and coarse-grained .... 2. *S. malaanonan*

dd. Leaves acute at the apex, chartaceous, with grayish pubescence of stellate hairs beneath; wood hard, fine-grained, red. 6. *S.* sp. (Pubescent guijo)

bb. Leaves not lighter in color beneath, usually the same on both surfaces.

c. Leaves usually cuneate at base.

d. Secondary nerves less than 10 pairs, domatia present .... 14. *S.* sp.

dd. Secondary nerves more than 10 pairs, domatia not present.... 5. *S. guiso*

cc. Leaves rounded or cordate at base.

d. Stipules small and early deciduous.

e. Leaves coriaceous, glabrous beneath, margins sometimes slightly inrolled .... 10. *S. polysperma*
11. *S. warburgii*

ee. Leaves chartaceous, with pubescence of stellate hairs beneath. 3. *S. philippinensis*

dd. Stipules of some size and persistent, at least on young shoots.

e. Stipules broadly ovoid, acute or obtuse, thickly covered with stellate hairs.

f. Leaves large, copper-color in drying .... 8. *S. squamata*

ff. Leaves small, pallid when dry .... 4. *S.* sp. (Saray)

ee. Stipules not so broad, lanceolate, acuminate.

f. Leaves lanceolate-acuminate, narrow, not prominently stellate-pubescent beneath; buds scurfy .... 12. *S. teysmanniana*

ff. Leaves elliptic or oblong, acuminate, prominently stellate-pubescent beneath.

g. Tertiary veins thickly beset with large stellate hairs; wood fine-grained, pale-red .... 9. *S. eximia*

gg. Tertiary veins not so thickly covered with stellate hairs; leaves more coriaceous; wood coarser-grained, bright-red. 7. *S. negrosensis*

1. **Shorea balangeran** (Korth.) Dyer ex Vidal Rev. Pl. Vasc. Filip. (1886) 61; Burck in Ann. Jard. Bot. Buitenz. **6** (1887) 214; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 86; Foxworthy in Phil. Journ. Sci. **4** (1909) Bot. 508, 516, *pl. XXVII, f. 67;* Whitford in Philip. Bur. For. Bull. **10**^{2} (1911) 73, *pl.* 78.

Hopea balangeran Korth. in Verh. Nat. Gesch. Bot. (1848) 74, *t.* 7; Miq. Fl. Ind. Bat. **1**^{2} (1859) 503; A. DC. Prodr. **16**^{2} (1868) 634.

Parahopea balangeran Heim Recherch. Dipterocarp. (1892) 66.

Young branches subcompressed, with peduncles and petioles lepidote-velutinous, fulvous; leaves rounded at base, ovate-oblong, acuminate, glabrous above, clothed beneath with very fine yellowish-brown pubescence, 10 to 20 cm long, 5 to 6 cm wide, secondary nerves 11 to 16, tertiary not very distinct. Petiole 2.5 cm long. Stipules lanceolate, acutish, stellate-pubescent on both sides. Racemes equalling or shorter than the leaves. Bracts subrotund, glabrous within, pubescent and ciliate without, yellow, 4 mm long, 3 mm wide. Calyx laciniae lanceolate, outside covered with simple, adpressed, cinereous, sericeous hairs, glabrous within. Petals three or four times as long as the calyx, oblong, glabrous within, sericeous without. Stamens 15; appendix to connective sometimes longer than the anther cells. The three larger segments of the fruiting calyx oblanceolate, obtuse, 6-nerved, transverse veins distinct, margin minutely ciliate, clear, base dilated, sparsely villous with stellate hairs. Fruit ovoid, acuminate. Only the immature fruit has been described.

None of our collections are in fruit and only one in flower. The sterile material shows a very great range of variability in shape and texture, and it is altogether probable that the following list contains representatives of what will prove to be several distinct species when we have more complete material for study.

From observations made by different foresters it seems that this species and *Hopea plagata* produce wood of almost the same quality and appearance, but that the trees may be distinguished by the bark, which is thick, black and coarsely furrowed in *H. plagata* and thin, gray and not coarsely furrowed in this species. Both furnish a high grade of the timber known as *yacal,* which corresponds very closely to the *selangan batu* of Borneo and the *thingan* of Burma.

LUZON, Province of Pangasinan, *For. Bur. 8278, 8279 Curran & Merritt, For. Bur. 9635 Zschokke, For. Bur. 13478, 13487 Medina, For. Bur. 14390 Villamil:* Province of Zambales, *For. Bur. 6507 Aguilar, For. Bur. 6931 Curran, For. Bur. 11045 Zschokke, For. Bur. 13203, 13204, 13205 Cortes, For. Bur. 19469 Agama:* Province of Tayabas, *For. Bur. 1, 5 Ware, For. Bur. 6065 Kobbe, For. Bur. 7096 Kobbe,* May 1907, in flower, *For. Bur. 12501 Rosenbluth, For. Bur. 18651 Darling, Bur. Sci. 13117, 13118, 13119, 13120 Foxworthy & Ramos:* Province of Camarines, *For. Bur. 10643, 10647, 10674, 10730 Curran, For. Bur. 11510, 11522, 11525 Whitford, For. Bur. 13352 Aguilar:* Province of Albay, *Cuming 884, For. Bur. 15002 Aldor, For. Bur. 18716 Darling.* LEYTE, *For. Bur. 12732, 12899 Rosenbluth.* MINDANAO, District of Davao, *For. Bur. 11562 Whitford:* District of Zamboanga, *For. Bur. 9031 Whitford & Hutchinson.*

Common names: *yacal, guisoc, guisoc-amarillo, guisoc-guisoc, pamayauasin, yamban puti.*

Distribution: Borneo; Madjang; Bangka; the Philippines.

2. **Shorea malaanonan** (Blanco) Blume in Mus. Bot. Lugd.-Bat. **2** (1856) 34; A. DC. Prodr. **16**^{2} (1868) 631; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 103; Foxworthy in Phil. Journ. Sci. **2** (1907) Bot. 386; Merrill & Rolfe in Phil. Journ. Sci. **3** (1908) Bot. 115; F.-Vill. Noviss. App. (1880) 21; Whitford in Philip. Bur. For. Bull. **10**^{2} (1911) 64.

Mocanera malaanonan Blanco Fl. Filip. (1837) 858.

Dipterocarpus malaanonan Blanco Fl. Filip. ed. 2 (1845) 312.

Shorea polita Vidal Sinopsis Atlas (1883) xv, *t. 15 f. D;* Rev. Pl. Vasc. Filip. (1886) 61; Brandis *l. c.* 88; Merrill & Rolfe *l. c.* 115.

Euphoria malaanonan Blanco Fl. Filip. ed. 1 (1837) 286 (289 sphalm.)

Euphoria ? nephelium Blanco Fl. Filip. ed. 2 (1845) 200.

A translation of Blanco's original description for *Mocanera malaanonan* is as follows: Leaves ovate, lanceolate, broad, abruptly pointed, whitish beneath. Calyx divided almost to the base into five oblong parts, constricted a little above the fruit; the three exterior more than 7.5 cm long. Fruit oval, free at maturity, surrounded by the calyx, outer covering fragile, crowned with a long style, which bears three stigmas, and with a seed of three or four lobules in a compartment. Trees of some diameter, known at Angat by the rather equivocal name of *malaanonang;* the leaves have a length of a span, they are broad and the new ones are whitish and soft beneath. This distinguishes it sufficiently from other members of the genus. The tree also gives an odorous resin, but in small quantity.

Vidal's description of *S. polita* evidently refers to a narrower form and is as follows: Leaves lanceolate-elliptic, acute at apex, rounded at base, the margin somewhat undulate; leaf blade 6 to 12 cm by 2 to 4 cm, petiole 2 to 3 cm; lateral nerves 12 to 15 pairs, slightly ascending (about 60°) not very distinct, very smooth in the interspaces. Fruiting calyx of a brilliant gray, the part which envelops the nut very round, with three long, usually unequal (5 to 8 cm) wings and 2 short and narrow (3 cm) reddish-yellow which are much reticulated and with about 10 nerves.

It seems that a narrow-leaved and a broad-leaved form of *malaanonang* are recognized by the natives, but they seem to be connected by intermediate forms and it is for that reason that the two are here classed as one species.

Closely resembling *S. coriacea* Burck but with larger and more nearly glabrous fruit. Perhaps the same species which was described as *S. hypocra* by Hance from Cochinchina, but usually with a smaller number of secondary nerves.

LUZON, Province of Cagayan, *For. Bur. 4279 Klemme*, June 1906, in fruit: Province of Ilocos Sur, *For. Bur. 13039 Paraiso:* Province of Nueva Ecija, *For. Bur. 8450, 8480 Curran, For. Bur. 22103 Alvarez:* Province of Pangasinan, *For. Bur. 12979, 12980 Alvarez*, May 1910, in fruit: Province of Zambales, *For. Bur. 6023 Aguilar:* Province of Rizal, *Vidal 71, 2155, 2166, 2168, For. Bur. 2685 Ahern's coll.*, Jan. 1905, in flower, *For. Bur. 2990 Ahern's coll.*, Apr. 1905, in flower and fruit, *Bur. Sci. 1420 Ramos:* Province of Tayabas, *For. Bur. 3233 Hagger*, Feb. 1905, in flower.

The following numbers represent the narrow-leaved form and seem to fit Vidal's description of *S. polita:*

LUZON, Province of Cagayan, *For. Bur. 11306 Klemme*, Apr. 1908, with immature fruit: Province of Nueva Ecija, *Vidal 989* (type): Province of Zambales, *For. Bur. 5915 Curran:* Province of Rizal, *For. Bur. 436 Ahern's coll.*, Feb. 1904, in flower, *For. Bur. 1168 Ahern's coll.*, June 1904, in flower, *Loher 5599*, Feb. 1906, in flower: Province of Tayabas, *Merrill 2851 Clark & Barnes*, Apr. 1903, in flower, *Merrill 2589 Ware*, June 1903, in fruit, *For. Bur. 18648 Darling.*

Common names: *malaanonan* (Tag.), *danlig* (Tay.), *layan puti* (N. E.), *mangasinoro* (Tay.).

3. **Shorea philippinensis** Brandis in Journ. Linn. Soc. Bot. **31** (1895) 88.

Petioles and inflorescence pubescent with stellate hairs. Leaves elliptic, underside pubescent with stellate hairs; leaf-blade 3 to 7 cm long; petioles up to 1 cm long; secondary nerves about 10 to 12, tertiary nerves inconspicuous. Bracts enclosing the buds subpersistent; anthers linear, long-aristate; appendage filiform, longer than anther. Ovary with base of style puberulous, style filiform glabrous exceeding the ovary; stigma minute.

LUZON, Province of Bulacan, *Vidal 983*: Province of Bataan, *For. Bur. 717 Borden*: Province of Tayabas, *For. Bur. 6068 Kobbe*. TICAO, *For. Bur. 12553 Rosenbluth*. LEYTE, *For. Bur. 12885 Rosenbluth*.

A very imperfectly known species. All of the material in our herbarium is sterile. The wood of some of the numbers credited to this is very light-colored and soft, of some of the others it is red. It is very likely that some of the numbers are wrongly identified.

4. **Shorea** sp. aff. *S. harmandii* Pierre.

A large tree, 30 m high and 75 cm in diameter. Wood white to brownish, soft; wood-parenchyma lines and lines of resin-canals inconspicuous or wanting. Vessels arranged in more or less regular patterns. Wood resembling that of *Pentacme* in appearance. Leaves elliptic, coriaceous, pallid above and beneath when dry, the very young leaves being darker in color; bluntly acuminate at apex, rounded or subcordate at base. Secondary nerves 12 to 15 pairs, tertiary nerves distinct and parallel. Leaf-blade 5 to 9 cm long, 3 to 5 cm wide. Petioles short, 8 to 9 mm long, and pubescent. Stipular bracts enclosing the bud, triangular-ovate, rather large and semipersistent, with several longitudinal nerves. Stipules leaving a very distinct scar on falling. Twigs dark-colored, pubescent, with short internodes. Fruit ovoid, about 1 cm long and about the same diameter, enclosed by the bases of the calyx-lobes; the 3 long calyx-wings oblong-spatulate, 7 cm long, 16 mm wide, with 10 to 12 longitudinal and numerous cross veins, the 2 short calyx-wings 4 to 6 cm long and 5 to 6 mm wide, with only 5 or 6 longitudinal nerves. Fruit green when fresh, reddish-brown when dry.

LUZON, Province of Cagayan, *For. Bur. 17158 Curran*, Mar. 1909, in fruit, *For. Bur. 7084 Klemme*: Province of La Laguna, *For. Bur. 17652 Curran*.

Common names: *saray* (Cag.), *danlig* or *white tiaong* (Lag.), *canacan* (Neg.).

5. **Shorea guiso** (Blanco) Blume Mus. Bot. Lugd-Bat. **2** (1856) 34; Vidal Sinopsis Atlas xv, *t. 15, f. C*; Perk. Frag. Fl. Philip. (1904) 23; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 89; Merr. in Phil. Journ. Sci. **1** (1906) Suppl. 98; Foxworthy in Phil. Journ. Sci. **2** (1907) Bot. 355, 357, 383, 384, **4** (1909) Bot. 419, 509, 517, *pl. XXVII, f. 70*; Everett & Whitford in Philip. Bur. For. Bull. **5** (1906) 16; Merritt & Whitford in Philip. Bur. For. Bull. **5** (1906) 36; Merritt in Philip. Bur. For. Bull. **8** (1908) 48; Whitford in Philip. Journ. Sci. **4** (1910) Bot. 703, Philip. Bur. For. Bull. **10**^{2} (1911) 71, *pls.* 74, 75.

Mocanera guiso Blanco Fl. Filip. ed. 1 (1837) 449.
Dipterocarpus guiso Blanco Fl. Filip. ed. 2 (1845) 313.
Anisoptera guiso A. DC. Prodr. 16² (1868) 616.
S. vidaliana Brandis l. c. 83.

Leaves chartaceous, ovate-lanceolate, acute or acuminate, base rounded or cuneate, glabrous or nearly so. Secondary nerves 15 to 18 pairs. Leaf-blade 7 to 15 cm long, 2 to 6 cm wide; petiole 1 to 3 cm long. Flowers described by Blanco as having 30 stamens. Fruit with three wings which are 2.5 to 3 cm long and 4 to 8 mm wide; the two short wings 15 to 20 mm long, 2 to 4 mm wide, linear or spatulate; fruit 4 to 6 mm in diameter and about 6 to 8 mm high, slightly stouter than the fruit of *S. polysperma*.

This species most closely resembles *S. polysperma*, from which it differs in its grayish bark, harder and grayer wood, usually thinner leaves which taper toward the base and are not inrolled at the margins, and the shorter and stouter fruit. The species is sufficiently variable to make any one set of characters of only comparative value and it is often extremely difficult to distinguish these two species from sterile material.

LUZON, Province of Cagayan, *For. Bur. 14730 Darling, For. Bur. 16960, 17255 Curran:* Province of Isabela, *For. Bur. 14842 Darling:* Province of Ilocos Norte, *For. Bur. 13851, 14012 Merritt & Darling:* Subprovince of Bontoc, *For. Bur. 17015 Curran:* Province of Abra, *For. Bur. 14653 Darling:* Province of Nueva Vizcaya, *For. Bur. 10877 Curran, For. Bur. 18025 Merritt:* Province of Nueva Ecija, *For. Bur. 8439, 8466 Curran, For. Bur. 14307 Saroca:* Province of Pangasinan, *For. Bur. 8397 Curran & Merritt, For. Bur. 13471, 13514 Medina, For. Bur. 14854, 14879 Villamil:* Province of Tarlac, *For. Bur. 15395 Zschokke:* Province of Pampanga, *For. Bur. 17692, 17735 Curran:* Province of Zambales, *For. Bur. 5811, 5995, 6912 Curran, For. Bur. 6081 Aguilar, For. Bur. 19470, 19475 Agama:* Province of Bataan, *Merrill 1482 Garcia, For. Bur. 490, 491, 508, 530, 543, 545, 550, 553, 572, 576, 581 Barnes, Dec. Phil. For. Fl. 71 Barnes*, Jan. 1904, in flower, *For. Bur. 659 Borden*, April 1904, in flower, *For. Bur. 1179, 1398, 1525, 1530, 1533, 1559, 1572 Borden, For. Bur. 1799 Borden*, Sept. 1904, in fruit, *Bur. Sci. 1605, 1614, 1642 Foxworthy, For. Bur. 5276, 5954, 6374, 17522 Curran, For. Bur. 7344 Curran*, June 1907, in fruit, *For. Bur. 13542 Alvarez:* Province of Bulacan, *Bur. Sci. 12867 Foxworthy:* Province of Rizal, *Vidal 984, For. Bur. 440, 1167, 2865 Ahern's coll.*, April–June 1904–5 in flower, *For. Bur. 3088 Ahern's coll., Bur. Sci. 20 Foxworthy, Bur. Sci. 1460 Ramos, For. Bur. 10038 Curran:* Province of La Laguna, *For. Bur. 19125 Tamesis, For. Bur. 22290 Mariano:* Province of Batangas, *For. Bur. 7087 Curran & Merritt:* Province of Tayabas, *For. Bur. 6056 Kobbe, For. Bur. 10174, 10269, 10320, 10375, 10393, 10400 Curran, For. Bur. 18660 Darling, Bur. Sci. 13116 Foxworthy & Ramos:* Province of Camarines, *Ahern 129 Garcia, For. Bur. 4537 Barredo, For. Bur. 10461, 10670, 10704 Curran:* Province of Albay, *For. Bur. 15003 Aldor:* Province of Sorsogon, *For. Bur. 10629 Curran.* MARINDUQUE, *For. Bur. 12159 Rosenbluth.* TICAO, *For. Bur. 12552 Rosenbluth.* MASBATE, *Whitford 1694, For. Bur. 12565 Rosenbluth, For. Bur. 21002 Darling.* MINDORO, *For. Bur. 5387, 8678, 8778, 8783, 9712, 9766, 11387, 12025 Merritt.* SAMAR, *For. Bur. 12873, 12849 Rosenbluth.* LEYTE, *For. Bur. 12799 Rosenbluth.* NEGROS, Province of Negros

Occidental), *For. Bur. 17446 Curran.* MINDANAO, Province of Misamis, *For. Bur. 6546 Hutchinson, For. Bur. 15473 Pray:* District of Davao, *For. Bur. 11553, 11558 Whitford:* District of Cotabato, *For. Bur. 15409 Pray:* District of Zamboanga, *For. Bur. 9005, 9485 Whitford & Hutchinson.* BASILAN, *For. Bur. 12368 Hutchinson.*

Ahern 840 Sherman, collected in Mindanao in 1901, was determined by Merrill (Philip. Bur. For. Bull. 1 (1903) 40) as *S. scrobiculata.* It should be referred to *S. guiso.*

Much of our material is sterile and it shows quite a range of variation. The mature leaves are usually glabrous or nearly so; but some specimens show leaves that are sparsely hairy; and some show a development of stellate hairs on the petioles and young shoots and on the midrib on the upper surface of the leaf. It is quite probable that there will prove to be more than one species in the material listed above, when we have more complete material for study and comparison.

Common names: *guijo, betik* (Lag.), *guisoc* (V., Moro), *sarai* (Il.), *yamban* (Il.).

6. **Shorea** sp.

This form differs from *S. guiso* principally in having a dense pubescence of grayish color on the underside of the leaves and on the twigs. The pubescence is composed of large stellate hairs, such as are found on the leaves of *S. eximia, S. squamata* and *S. philippinensis.* The leaf-shape is very constantly that of *S. guiso* and the venation seems to be much the same. The wood may be slightly harder than that of guijo.

LUZON, Province of Bataan, *For. Bur. s. n. Meyer, For. Bur. 6373, 17520 Curran, Bur. Sci. 10845 Foxworthy:* Province of Zambales, *For. Bur. 5899, 6933 Curran, For. Bur. 6506 Aguilar:* Province of Pampanga, *For. Bur. 17699 Curran:* Province of La Laguna, *For. Bur. 10076 Curran, For. Bur. 12679 Rosenbluth & Tamesis.*

7. **Shorea negrosensis** sp. nov. Plate XLIV.

Arbor magna, 40 ad 50 m alta, 2 m diametro. Folia elliptica, oblonga, vel ovata; lamina 9 ad 15 cm longa, 4 ad 6 cm lata; petiolo 1.5 ad 2.5 cm longo. Nervis secondariis 12 ad 16. Stipulae parvae fugaceae. Paniculae terminales. Petala intus glabra, extus sericea. Stamina circiter 30; filamenta subtus lata et sursum fastigata. Ovarium conoideum pilosum. Stylopodium 0. Stylus glaber.

Gregarious in habit. Bark thick, black and fissured. Wood deep-red at the heart, the heart taking up a large proportion of the log. Logs often rotten at the heart. Base of leaf rounded, apex sharply acuminate. Midrib depressed and tomentose above, prominent and pilose beneath. Secondary veins prominent on underside of leaf. Tertiary veins parallel or reticulate, distinct and with regularly spaced large stellate hairs. This gives the underside of the leaf an appearance much like that of *almon* (*S. eximia*), but with a lesser degree of hairiness. When dried, the leaves often have a coppery color on the under surface. Stipules small, triangular, nerved, hairy, fugacious. Flowers in terminal panicles. Calyx and petals with dense grayish or yellowish tomentum on the outside, glabrous within. Petals dark-red within. Flowers said to have a rather sickeningly sweet odor. Petals prominently longitudinally veined. Filaments black between the oblong anthers. Appendage to the connective tapering and shorter than the anther. Ovary bluntly conical in outline, hairy. No stylopodium. Style smooth; stigma small and obscurely lobed.

One of the most important of our timber trees. The wood is very pretty, coarse-grained and moderately hard. It is sometimes exported under the name of "Philippine Mahogany." This tree is most abundant in the northern part of the Island of Negros, where it occurs gregariously with *almon*, *balacbacan* and *bagtican*. It is, perhaps, the most important commercial wood of the Philippines at the present time.

The leaves of this species show close resemblances to those of *S. lepidota* Bl., of Sumatra, *S. selanica* Bl., of Amboina, and *S. platycarpa* Heim, of Sarawak.

For. Bur. 7281 Everett, collected in Negros Occidental in May 1907, is the type.

LUZON, Province of Cagayan, *For. Bur. 6498 Klemme, For. Bur. 17170 Curran:* Province of Isabela, *For. Bur. 6644 Klemme:* Province of La Laguna, *For. Bur. 22311 Mariano:* Province of Tayabas, *Merrill 1152 Garcia:* Province of Albay, *For. Bur. 10620 Curran:* Province of Sorsogon, *For. Bur. 10601 Curran.* NEGROS, Province of Negros Occidental, *For. Bur. 7281 Everett*, May 1907, in flower (type), *For. Bur. 5209, 5500 Everett, For. Bur. 5212, 7405 Danao, For. Bur. 7253 Everett*, May 1907, in bud, *For. Bur. 13583 Meyer & Foxworthy, For. Bur. 17467, 17469, 17470, 17480, 17482, 17491, 17497 Curran.* MINDANAO, Province of Surigao, *For. Bur. 6672 Stone, For. Bur. 7566 Hutchinson:* Subprovince of Agusan, *For. Bur. 7596, 7598, 7610 Hutchinson.*

Common names: *red lauan, mangachapuy* (V.).

For description of habit of this species see Whitford in Philip. Bur. For. Bull. 10^{2} (1911) 66, *pls. 64, 65.*

8. **Shorea squamata** (Turcz.) Dyer ex Vidal Rev. Pl. Vasc. Filip. (1886) 62; Brandis in Journ. Linn. Soc. Bot. 31 (1895) 92; Merr. in Phil. Journ. Sci. 2 (1907) Bot. 285; Foxworthy in Phil. Journ. Sci. 2 (1907) Bot. 386; Phil. Journ. Sci. 4 (1909) Bot. 519; Merritt in Philip. Bur. For. Bull. 8 (1908) 16, 48; Whitford in Philip. Journ. Sci. 4 (1910) Bot. 715, Philip. Bur. For. Bull. 10^{2} (1911) 66, *pl. 63.*

Hopea squamata Turcz. in Bull. Soc. Mosc. 31^{1} (1858) 239; A. DC. Prodr. 16^{2} (1868) 635.

Leaves coriaceous or chartaceous, from a rounded base ovate-oblong or elliptic, upper side glabrous, under side rough with tufts of stellate hair; secondary nerves 14 to 18, curved, tertiary veins parallel; blade 10 to 20 cm long, petiole 2 cm long. Flowers bibracteolate in unilateral spikes, these distichous, in long axillary and terminal panicles, bracts oblong spathulate. Filaments of the 5 inner episepalous stamens with a thick rounded base, upon which the next 5 filaments are inserted; appendage of connective slightly longer than anther. Stylopodium smaller than ovary; style glabrous, twice the length of stylopodium; stigma minute. Larger segments of fruiting-calyx 15 to 17.5 cm long.

The stipules are larger than in any other species of *Shorea* which we have and these stipules are frequently persistent and extend nearly around the stem. In some cases, it seems that the stipules drop early and this makes it more difficult to recognize the species. There is great variation in the abundance of the stellate hairs. The leaves are sometimes found to be almost glabrous, but this is not very commonly the case and usually results in a very distinct form.

LUZON, Province of Cagayan, *For. Bur. 14709 Darling, For. Bur. 17077, 17169, 17187 Curran:* Province of Isabela, *For. Bur. 14839 Darling:* Province of Ilocos Norte, *For. Bur. 13924, 13926 Merritt & Darling:* Province of Nueva Ecija, *For. Bur. 22152 Alvarez:* Province of Bulacan, *For. Bur. 11150 Aguilar, For. Bur. 15436 Cortez:* Province of La Laguna, *For. Bur. 10095, 17631, 17643 Curran, Bur. Sci. 8978 Foxworthy, For. Bur. 15351 Tamesis, For. Bur. 22318 Mariano:* Province of Tayabas, *For. Bur. 6075 Kobbe, For. Bur. 9659, 10173, 10290 Curran, For. Bur. 11511 Whitford, For. Bur. 12518 Rosenbluth, For. Bur. 18624 Darling:* Province of Camarines, *For. Bur. 4534 Barredo, For. Bur. 10758 Curran:* Province of Albay, *Cuming 883, 892:* Province of Sorsogon, *For. Bur. 10604 Curran.* POLILLO, *Bur. Sci. 10778 McGregor.* MARINDUQUE, *For. Bur. 12154 Rosenbluth.* MINDORO, *Merrill 5751, For. Bur. 8743, 6799, 6806, 6823, 11400, 11386 Merritt.* SAMAR, *For. Bur. 12839, 12860, 12881 Rosenbluth.* LEYTE, *For. Bur. 12742 Rosenbluth.* MINDANAO, Subprovince of Agusan, *For. Bur. 7608 Hutchinson:* Province of Misamis, *For. Bur. 4704 Mearns & Hutchinson,* May 1906, immature fruit: District of Davao, *For. Bur. 11561 Whitford:* District of Lanao, *Mrs. Clemens s. n., For. Bur. 15448, 15447 Pray:* District of Zamboanga, *For. Bur. 9242 Whitford & Hutchinson.*

Common names: *mayapis* (Tag.), *alam* (Mangyan), *balabak* (Ib.), *danlig* (Tay.), *lauan* (Tag.), *malacacao* (Tay.), *malakayan* (Moro), *malasinoro* (Sam.), *oghayan* (Sam.), *tabak* (Tay.), *ubanan* (Manobo).

Distribution: Borneo and the Philippines.

9. **Shorea eximia** (Miq.) Scheffer in Nat. Tidschr. Nederl. Ind. **31** (1870) 349; Burck in Ann. Jard. Bot. Buitenz. **6** (1887) 218; King in Journ. Asiat. Soc. Beng. **62^{2}** (1893) 121.

Vatica ? eximia Miq. Fl. Ind. Bat. Suppl. (1862) 486; A. DC. Prodr. **16^{2}** (1868) 623.

Vatica ? sublacunosa Miq. l. c. 486; Ann. Mus. Bot. Lugd.-Bat. **3** (1867) 85.

Shorea sublacunosa Scheffer in Nat. Tidschr. Nederl. Ind. l. c. 350.

Shorea furfuracea Miq. l. c. 488, Ann. Mus. Bot. Lugd.-Bat. **3** (1867) 84; Rolfe in Journ. Bot. **23** (1885) 210; Vidal Rev. Pl. Vasc. Filip. (1886) 62; Burck l. c. 219; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 98; Merrill in Philip. Journ. Sci. **1** (1906) Suppl. 98; Foxworthy in Philip. Journ. Sci. **4** (1909) Bot. 517; Whitford in Philip. Journ. Sci. **4** (1910) Bot. 712, Philip. Bur. For. Bull. **10^{2}** (1911) 63, *pls. 58, 59.*

Very large trees, which are gregarious in habit. Bark ridged, 1.5 to 2 cm thick. Branchlets, stipules, petioles, underside of leaves, and branches of inflorescence with tufts of stellate hairs, which sometimes are very long; stellate hairs most abundant on the veins on the underside of the leaf. Stipules broad, semipersistent, triangular-ovate, as long as or shorter than the petioles. Leaves thin, papery, elliptic-oblong, sometimes lanceolate, sometimes oblanceolate, shortly acuminate, 8 to 18 cm long, 3 to 8.5

cm wide. Petiole 1 to 2 cm long. Secondary nerves 14 to 22 pairs, arching; tertiary parallel, prominent. Flowers sessile, in secund bracteate spikes, each flower subtended by two unequal bracts. Ovary pubescent, narrowed into a glabrous filiform style, much longer than ovary; stigma minute. Fruiting calyx with 3 wings 9 to 12.5 cm long, 15 mm wide, narrowed below, but base dilated, tightly enclosing the fruit; transverse veins and 7 to 9 longitudinal veins prominent.

Fruits abundantly in August, but the fruit is quickly eaten by wild hogs, etc., perhaps for contained fat, and in a very few days, it is difficult to find any of the seeds remaining.

The resin is sometimes collected from the tree for torches, etc., although, I think, not on a commercial scale. The timber is used in great quantities under the name of *almon*.

LUZON, Province of Bataan, *Merrill 1545 Garcia:* Province of Tayabas, *For. Bur. 11500 Whitford:* Province of Camarines, *For. Bur. 10716 Curran:* Province of Albay, *Cuming 880*, in flower, *For. Bur. 10577 Curran, For. Bur. 12628 Rosenbluth:* Province of Sorsogon, *For. Bur. 10555, 10562, 10628 Curran.* NEGROS, Province of Negros Occidental, *Whitford 1579, For. Bur. 5502 Everett, For. Bur. 15017 Danao, For. Bur. 11647 Whitford*, April 1909, in flower, *For. Bur. 13580 Meyer & Foxworthy*, Sept. 1909, fruit, *For. Bur. 13686, 17466, 17479, 17490, 17498 Curran, For. Bur. 18222 Rosenbluth*, Aug. 1909, fruit. MINDANAO, Province of Surigao, *For. Bur. 6673 Stone, For. Bur. 7566a Hutchinson:* Province of Misamis, *For. Bur. 22461 Klemme:* District of Zamboanga, *For. Bur. 9243, 9373 Whitford & Hutchinson, For. Bur. 12353, 12354 Hutchinson.* BASILAN, *For. Bur. 3452, 6092 Hutchinson.*

Common names: *almon, white lauan.*

Distribution: Malacca, Singapore, Sumatra, Bangka, Dindang, Bintang, Borneo (*Foxworthy 159*, collected in the western part of Sarawak in May 1909), the Philippines.

10. **Shorea polysperma** (Blanco) Merrill in Bur. Govt. Lab. Publ. (Philip.) **27** (1905) 22, **29** (1905) 29; Phil. Journ. Sci. **1** (1906) Suppl. 98; Foxworthy in Phil. Journ. Sci. **2** (1907) Bot. 356, 357, 394, **4** (1909) Bot. 423, 510, 518, *pl. XXVII, f. 72*, Everett & Whitford in Philip. Bur. For. Bull. **5** (1906) 26; Merritt in Philip. Bur. For. Bull. **8** (1908) 16, 48; Withford in Philip. Journ. Sci. **4** (1910) Bot. 703, Philip. Bur. For. Bull. **10**^{2} (1911) 68, *pls. 66, 67.*

Mocanera polysperma Blanco Fl. Filip. ed. 1 (1837) 448.

Dipterocarpus polyspermus Blanco Fl. Filip. ed. 2 (1845) 312; A. DC. Prodr. **16**^{2} (1868) 614.

Hopea tangili Blume Mus. Bot. Lugd.-Bat. **2** (1856) 35; A. DC. Prodr. **16**^{2} (1868) 635.

Shorea talura F.-Vill. Noviss. App. (1880) 21, non Roxb. Hort. Beng. (1814) 93.

A very large tree of the hill forests, at from 100 to 800 m above the sea, reaching a height of 50 m and a diameter of more than 2 m. Leaves ovate-lanceolate, acuminate, 8 to 11 cm long, 3 to 5 cm wide, shining, subcoriaceous, the base rounded, rarely somewhat acute, the apex usually rather long-acuminate; nerves 10 to 12 pairs, subprominent, ascending;

petioles 2 cm long, glabrous or at first pubescent. Panicles 20 cm long or less, the branches ascending, the lower ones often 15 cm long, densely pubescent with gray hairs. Flowers small, yellowish. Sepals imbricate, broadly ovate, obtuse or subacute, 3 mm long, 2.5 mm wide, densely pubescent, the three outer ones inclosing the two inner. Petals 8 mm long, 3.5 mm wide, obtuse. Stamens 15, in two series, the filaments broad, 1 mm long; anthers broadly ovate, 0.6 mm long, the appendix to the connective slender, as long as the anther. Ovary pubescent, the stylopodium very obscure or wanting. Style slender, 1.5 mm long. In the fruit all the sepals are accrescent, the three outer ones being 4.5 cm long, and 8–10 mm wide, obtuse, the two inner ones about 2 cm long or less, and 3 mm wide.

LUZON, Province of Cagayan, *For. Bur. 17188, 17207, 17239, 17254 Curran:* Province of Ilocos Norte, *For. Bur. 13917 Merritt & Darling:* Province of Pangasinan, *For. Bur. 8288, Curran & Merritt, For. Bur. 14378, 14380 Villamil:* Province of Nueva Ecija, *For. Bur. 22156 Alvarez:* Province of Bulacan, *For. Bur. 11149 Aguilar, For. Bur. 15435, 15437 Cortez:* Province of Bataan, *For. Bur. 606 Barnes, For. Bur. 734, 784 Borden,* May 1904, in flower, *For. Bur. 819 Borden,* June 1904, in flower, *For. Bur. 1410 Borden,* July 1904, in fruit, *For. Bur. 2130 Bordon, Whitford 132,* May 1904, in flower, *Dec. Phil. For. Fl. 187 Borden, Bur. Sci. 1604 Foxworthy, For. Bur. 5280, 6237, 6324 Curran, For. Bur. 7221 Curran,* June 1907, in flower, *For. Bur. 7377 Curran,* July 1907, in fruit, *For. Bur. 20029 Topacio:* Province of La Laguna, *For. Bur. 10139, 17636 Curran, For. Bur. 15095 Cortes, For. Bur. 15355 Tamesis, For. Bur. 22498 Mariano:* Province of Tayabas, *For. Bur. 10373, 10403 Curran, For. Bur. 11502 Whitford, For. Bur. 12505, 12506 Rosenbluth:* Province of Camarines, *For. Bur. 10756 Curran, For. Bur. 11524 Whitford:* Province of Albay, *For. Bur. 10574 Curran, For. Bur. 14282 Aguilar, For. Bur. 15071, 15089 Rosenbluth:* Province of Sorsogon, *For. Bur. 10550 Curran.* MARINDUQUE, *For. Bur. 12169 Rosenbluth.* MINDORO, *For. Bur. 6791, 6826, 8587, 8623, 8780, 9806, 11402, 11407, 11410, 12010, 12013, 12026 Merritt.* LEYTE, *For. Bur. 15060 Rosenbluth.* CEBU, *For. Bur. 6489 Espinosa.* NEGROS, Province of Negros Occidental, *Whitford 1615, For. Bur. 5503 Everett, For. Bur. 13578 Meyer & Foxworthy, For. Bur. 13754 Foxworthy,* Sept. 1909, fruit, *For. Bur. 13756 Foxworthy, For. Bur. 17468, 17478 Curran.* MINDANAO, Province of Surigao, *Long 43.*

Common names: *tangile* (Tag.), *abuhungan* (Al.), *adamui* (B.), *araka* (Il.), *balakbakan* (Neg.), *balagayan* (Mangyan), *damilang* (Ib.), *manaog* (Cebu), *mayapis* (Tay.), *pata* (Pang.), *maligmat* (Tag.).

The name *tanguile* is often applied to other plants which have soft or moderately hard red wood, whether they belong to this family or not. In the provinces of Bulacan, Tayabas and Mindoro, the name *tanguile* is often applied to *Illipe ramiflora* Merr., of the *Sapotaceae.*

11. **Shorea warburgii** Gilg in Engler Bot. Jahrb. **18** Beibl. **45** (1894) 38; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 98; Perkins Fragm. Fl. Philip. (1904) 23.

This is very imperfectly known and may be merely a form of *S. polysperma.* The type of *S. warburgii* has rather larger leaves than are common for *S. polysperma.*

I have referred to this species *For. Bur. 17067*, collected in Cagayan Province, Luzon, by Mr. Curran.

The two numbers credited to this species by Perkins, l. c., I have referred to *S. guiso*.

The type of the species was collected by Warburg, *no. 12399*, in Northern Luzon. Wood a coarse grained red lauan.

12. **Shorea teysmanniana** Dyer ex Brandis in Journ. Linn. Soc. Bot. **31** (1895) 100; Whitford in Philip. Bur. For. Bull. **10** ^{2} (1911) 68.

Gordonia acuminata Vidal Rev. Pl. Vasc. Filip. (1886) 58, non *Shorea acuminata* Dyer.

Gordonia vidalii Szysz. in Engler & Prantl Nat. Pflanzenfam. **3** ^{6} (1893) 185; Merr. in Phil. Journ. Sci. **3** (1908) Bot. 114.

Described by Dyer from a sterile specimen collected by Teysmann in Bangka and distributed under the name of *Hopea fagifolia* Miq.

Leaves ovate-oblong, acuminate, pale-brownish beneath. Stipules lanceolate, slightly falcate, 2 to 2.5 cm long, 5 to 8 mm broad, caducous; secondary nerves 10 to 14 pairs, tertiary nerves parallel and not very prominent. Leaf-blade 12 to 15 cm long, 4 to 6 cm wide; petiole 1 to 1.5 cm long. Differs from *S. polysperma* in the larger stipules and in having the midrib tomentose above. There is also the occasional development of domatia in the axils of the secondary nerves beneath. Bark not shedding from the mature tree in strips as in *S. polysperma*. Produces an exceedingly good, fine and straight-grained, soft, red wood.

LUZON, Province of Cagayan, *For. Bur. 17076 Curran, For. Bur. 13416 Klemme:* Province of Ilocos Norte, *For. Bur. 13920, 14014 Merritt & Darling:* Province of Nueva Ecija, *For. Bur. 22148 Alvarez:* Province of Bulacan, *Vidal 1146* (described by Vidal as *Gordonia acuminata*), *Bur. Sci. 12283 Foxworthy:* Province of La Laguna, *For. Bur. 10149, 10126, 17630, 17632, 17644 Curran, Bur. Sci. 8980, 8981, 8992 Foxworthy, Bur. Sci. 10022, 10961 Ramos, For. Bur. 15347, 15354 Tamesis, For. Bur. 15093 Cortes, For. Bur. 22308, 22310, 22501 Mariano:* Province of Tayabas, *For. Bur. 23011 Aguilar:* Province of Camarines, *For. Bur. 10714, 10715 Curran:* Province of Sorsogon, *For. Bur. 10563 Curran.* POLILLO, *Bur. Sci. 10284, 10782 McGregor.*

Common names: *tiaong* (Tag.), *malaguiso* (Tag.), *betic* (Tag.), *malatiaun* (Tag.), *tanic* (Cag.).

13. **Shorea** sp.

For. Bur. 9432, Hutchinson, District of Zamboanga, Feb. 1908.

Large leaves picked up from the ground. They are manifestly distinct from anything else which we have in the family.

Coriaceous, oblong or oblong-lanceolate, 20 to 25 cm long, 5 to 8 cm wide; petiole 2 cm long. Margins distinctly inrolled. Secondary veins about 15 pairs. Wood dark-red, coarse and straight-grained. An exceedingly good grade of red lauan. A coarse grained red lauan like *S. warburgii*.

14. **Shorea** sp.

For. Bur. 9174, 9493 Whitford & Hutchinson, collected in the District of Zamboanga, Mindanao, in Dec., 1907, and Feb., 1908, respectively.

The leaves have much the appearance of those of *Hopea plagata;* but the wood is a red lauan and presumably a species of *Shorea*. Wood red, fine-grained.

6. PARASHOREA Kurz.

Calyx-tube very short, not enlarging. Sepals on the edge of a broad receptacle, almost valvate in bud. Stamens 12 to 15; anthers linear, on short filaments, the connective more or less prolonged; anther cells more or less unequal, the two posterior shortly beaked. Ovary free, hairy, 3-celled; style filiform. Fruit tomentose, acuminate. Five nearly equal wings narrowed below, not inclosing the fruit. In our species, the stipules are large, encircling the stem. Also, our species shows a distinct fold between the pairs of secondary nerves and is glaucous on the underside of the leaf and on the young twigs.

The genus has three species, one from the Eastern Peninsula of India, one from Sumatra, and the third from Borneo and the Philippines.

The bark of old trees is coarsely and deeply furrowed and dark-colored. Sapwood very light-colored; heartwood darker, often with a pinkish tinge. The wood is soft and moderately heavy and contains numerous resin-canals, filled with a whitish resin. Trees distinctly gregarious in habit, in moist forests.

Pith with 15 resin-ducts. Petiole with 5 vascular bundles in the semicircle and just as many resin-canals, central bundle-mass with no resin-canals.

1. **Parashorea plicata** Brandis in Journ. Linn. Soc. Bot. **31** (1895) 104; Merrill & Rolfe in Philip. Journ. Sci. **3** (1908) Bot. 114; Foxworthy in Philip. Journ. Sci. **4** (1909) Bot. 511, 516; Whitford in Philip. Journ. Sci. **4** (1910) Bot. 712, Philip. For. Bur. Bull. **10**² (1911) 64, *pls. 60, 61.*

P. warburgii Brandis l. c. 105.

Large trees, 20 to 40 m tall and 1 to 2 m in diamenter. Bark 1 to 2 cm thick, longitudinally furrowed, dark-brown to nearly black in color. Leaves glabrous and shining above, elliptic, 6 to 15 cm long, 5 to 8 cm wide, marked by a distinct fold between the secondary nerves, similar to what is seen in many species of *Dipterocarpus*. In the terminal bud the young leaves are completely inclosed within the amplexicaul stipules, and the tender leaf at that stage consists almost entirely of the closely approximate secondary nerves. Stipules deciduous. Flowers 2.5 cm long, on thick pedicels furrowed when dry, which are half the length of the sepals. Sepals lanceolate, slightly overlapping in bud, gray-tomentose outside, pubescent inside. Stamens 15; anthers linear, glabrous; valves nearly equal, the two posterior bluntly apiculate; appendage of the connective longer than the anther, thick spindle-shaped, with a long point. Ovary-cells half-immersed in the broad obconical receptacle, narrowed into an elongate hairy stylopodium. The 3 outer wings of fruiting calyx broader, 8- or 9-nerved, with prominent reticulate veins between the longitudinal nerves, similar to the venation in the fruiting sepals of the other species of the genus.

LUZON, Province of Nueva Ecija, *For. Bur. 22346 Alvarez:* Province of Bulacan, *For. Bur. 15438 Cortes, Bur. Sci. 12274 Foxworthy:* Province of Rizal, *Bur. Sci. 1461 Ramos, Bur. Sci. 2660 Ramos,* May 1907, in flower, *Bur. Sci. 3289 Ramos,* May 1907, in fruit, *For. Bur. 10010, 10016 Curran:* Province of La Laguna, *Vidal 990, For. Bur. 10059, 10071, 17629 Curran, For. Bur. 12775 Rosenbluth & Tamesis, Bur. Sci. 11944 Robinson & Ramos, For. Bur. 22249, 22250 Mariano:* Province of Tayabas, *Merrill 1151 Garcia, Hagger 6, Merrill 51 Ritchie, For. Bur. 10176, 10377, 10404 Curran:* Province of Camarines, *Ahern 104 Garcia,* Mar. 1902, in flower, *Ahern 291 Garcia, For. Bur. 10500, 10502, 10668, 10703, 10713, 10739 Curran, For. Bur. 11520 Whitford, For. Bur. 14279, 14338 Aguilar:* Province of Albay, *For. Bur. 10584 Curran:* Province of Sorsogon, *For. Bur. 4528 Zschokke, For. Bur. 5754 Pray, For. Bur. 10506, 10603 Curran.* POLILLO, *Bur. Sci. 10282 McGregor.* CATANDUANES, *For. Bur. 6679 Pray.* MASBATE, *Whitford 1673, For. Bur. 12570, 12591 Rosenbluth.* NEGROS, Province of Negros Occidental, *Whitford 1616, For. Bur. 11194 Everett, For. Bur. 11646 Whitford,* April 1909, in flower, *For. Bur. 13755 Foxworthy, For. Bur. 17418, 17488 Curran:* Province of Negros Oriental, *For. Bur. 11244, 12314 Everett.* LEYTE, *For. Bur. 12624 Rosenbluth, For. Bur. 11635 Whitford, For. Bur. 12769 Rosenbluth,* Mar. 1909, in flower. CEBU, *For. Bur. 22212 Cenabre.* MINDANAO, Province of Surigao, *Ahern 356 Quadras, For. Bur. 7563 Hutchinson:* District of Davao, *For. Bur. 11560 Whitford:* District of Zamboanga, *For. Bur. 9182 Whitford & Hutchinson, For. Bur. 12355 Hutchinson.*

The following numbers represent a form which is pubescent on the young twigs and on the underside of the leaves.

LUZON, Province of La Laguna, *For. Bur. 7904, 8051, 8050 Curran & Merritt, For. Bur. 15349 Tamesis:* Province of Tayabas, *For. Bur. 6047 Kobbe, For. Bur. 7851 Curran & Merritt, For. Bur. 10221 Curran, For. Bur. 14936 Darling.*

I have also collected this same form in the neighborhood of the Si Bode River about 30 miles southwest of Sandakan, British North Borneo, in October 1908 (*no. 568*).

Native names: *lauan* (Tag.), *almon* (V.), *apnit* (S. Luz.), *bagtican* (V.), *bayukan* (Lag.), *danlig* (Tay.), *hapnit* (S. Luz.), *malaanonan* (Tag.), *mangasinoro* (Mas.), *mayapis* (Bal.).

VATICA Linn.

Brandis (l. c. 118) characterizes the genus as follows: "Leaves as a rule coriaceous, petioles generally pubescent. Stipules mostly small, caducous. Secondary nerves distinct and limited in number, tertiary mostly reticulate. Flowers in spikes or racemes, not unilateral, arranged in terminal and axillary panicles. In some species there is what appears to be a cyme. The axis bifurcates, and there is an apparently terminal flower in the bifurcation. On closer examination it is found that what appears to be a terminal flower is the lowest lateral flower of the main axis or of the branch which has developed as strongly as the main axis. The calyx is valvate. Stamens 15, of which 10 are episepalous, standing in 5 pairs behind each other. Anthers short, glabrous; cells very unequal, diverging at the base; appendix of connective obtuse, often very short, those of the 5 inner much longer. Ovary either free or half immersed in the obconical receptacle, often pitted, generally hairy; style cylindric, often ribbed and furrowed, mostly shorter than ovary; stigma capitate or conical. Segments of fruiting calyx either equal, shorter than fruit, or equal and much longer than fruit, or two segments growing out into long wings. So far as known, the cells of the cotyledons filled with starch.

"Pith of internode with 10 to 20 small peripheral resin-canals. Petiole; peripheral bundle-system with 3 to 10 resin-canals, the central with a few resin-canals or without them."

About 45 species known, with probably 5 species in the Philippines.

Quite probably, some of the very variable material which is lumped under *V. mangachapoi* may be referable to other species when more complete specimens are secured.

KEY TO PHILIPPINE SPECIES OF VATICA.

a. Leaves chartaceous.
  b. Leaves broadly oval; wood light-colored and soft................ 4. *V.* sp. (calunti)
  bb. Leaves oblong or elliptic; wood dark-colored and hard
5. *V.* sp. (bagansusu)
aa. Leaves coriaceous.
  b. Leaves yellow beneath .... 3. *V.* sp. (guiso madlao)
  bb. Leaves green on both surfaces.
    c. Narrowly oblong or elliptic .... 1. *Vatica mangachapoi*
    cc. Broadly oblong .... 2. *V.* sp. (yacal blanco)

1. **Vatica mangachapoi** Blanco Fl. Filip. ed. 1 (1837) 401; A. DC. Prodr. **16**^{2} (1868) 623; Vidal Sinopsis Atlas (1883) xv, *t. 15 B, ff. 1–6,* Rev. Pl. Vasc. Filip. (1886) 61; Brandis in Journ. Linn. Soc. Bot. **31** (1895) 134; Merr. in Bur. Govt. Lab. Publ. (Philip.) **27** (1905) 22; Phil. Journ. Sci. **1** (1906) Suppl. 98; Foxworthy in Phil. Journ. Sci. **4** (1909) Bot. 520; Whitford in Philip. Journ. Sci. **4** (1910) Bot. 703, Philip. Bur. For. Bull. **10**^{2} (1911) 76, *pl. 81.*

Mocanera mangachapoi Blanco Fl. Filip. ed. 1 (1837) 450.

Vatica aptanthera Blanco Fl. Filip. ed. 2 (1845) 281.

Dipterocarpus mangachapoi Blanco Fl. Filip. ed. 2 (1845) 313.

Pteranthera mangachapoi Blume Mus. Bot. Lugd-Bat. **2** (1856) 30.

Shorea mangachapoi (Blanco) Blume Mus. Bot. Lugd-Bat. **2** (1856) 34.

Anisoptera mangachapoi A. DC. Prodr. **16**^{2} (1868) 610; Vidal Cat. Pl. Prov. Manila (1880) 18.

Cotylelobium philippinense Heim ms. in herb. Kew; Brandis in Journ. Linn. Soc. Bot. l. c. 134.

This species is very incompletely understood; but, I have followed the interpretation accepted by Brandis.

A moderate-sized tree of the hill forests. Not gregarious. Bark light-grayish and rather smooth. Wood hard and heavy, brownish, fine-grained, resembling yacal but finer- and straighter-grained. Glabrous, excepting inflorescence and young shoots, which are clothed with stellate tomentum. Stipules small, caducous. Leaves pale on both sides, coriaceous, lanceolate; blade 7.5 to 12.5 cm long; petiole 1 cm long. Secondary nerves 7 to 9 pairs; tertiary reticulate. Flowers 1 cm long, on pedicels nearly as long as the calyx, in racemes which are not unilateral, these arranged in terminal and axillary racemose panicles. Pseudoterminal flowers frequent between the main axis and a branch of panicle. Calyx-segments in flower more or less unequal, two larger, on both sides with gray-stellate pubescence. Petals linear-oblong, obtuse, hairy outside. The five interior stamens on filaments longer than anthers, the ten outer on very short filaments; prolongation of connective short, conical. Ovary more or less immersed in the receptacle, tomentose with stellate hairs; style glabrous, 5-ribbed; stigma of five conical lobes, the two larger segments of fruiting-calyx 5 cm long, linear-oblong, narrowed at both ends, with five longitudinal nerves joined by oblique veins. Fruit (not ripe) globose, tomentose, 4 mm in diameter, the three cells still visible, one ovule more developed than the others.

Blanco describes this species as having three seeds in the ripe fruit. This is incorrect. He must have been examining the unripe fruit and looking at the ovules, only one of which develops into a mature seed. Fruiting calyx with 2 long wings, 3.5 to 4 cm long, 12 to 18 mm wide, with about 5 principal longitudinal nerves; the three shorter wings of the fruiting-calyx 10 to 18 mm long, 3 to 4 mm wide, with 3 or 4 principal longitudinal veins. Wings membranous or chartaceous. This species contains very little resin. The bark is thin and dry and presents a rather mottled appearance.

Closely resembling *Vatica astrotricha* of Cochin-China.

LUZON, Province of Cagayan, *For. Bur. 17070 Curran:* Province of Ilocos Norte, *For. Bur. 13995 Merritt & Darling:* Province of Ilocos Sur, *For. Bur. 5654 Klemme, For. Bur. 7110 Klemme*, Apr. 1907, in flower, *For. Bur. 13019 Paraiso:* Subprovince of Benguet, *For. Bur. 10800 Curran:* Province of La Union, *Elmer 5737*, Feb. 1904, in flower: Province of Pangasinan, *For. Bur. 8337 Curran & Merritt, For. Bur. 12982 Alvarez, For. Bur. 13452, 13518, 13524 Medina, For. Bur. 19457 Agama:* Province of Tarlac, *Vidal 68, 75:* Province of Nueva Ecija, *Vidal 988, For. Bur. 22147 Alvarez:* Province of Zambales, *Warburg 13430:* Province of Bataan, *For. Bur. 807, 815 Borden, For. Bur. 804 Borden*, May 1904, in flower, *For. Bur. 1593 Borden*, Aug. 1904, in fruit, *Merrill 3896*, Aug. 1904, in fruit, *Whitford 306*, May 1904, in flower, *Whitford 1224*, Apr. 1905, in flower, *Bur. Sci. 1556 Foxworthy, For. Bur. 12399 Curran & Merritt, For. Bur. 17521, 17600 Curran:* Province of Rizal, *Vidal 69, 70, 72, 78, 74, For. Bur. 483 Ahern's coll.*, Apr. 1904, in flower, *For. Bur. 1097 Ahern's coll.*, May 1904, in fruit, *For. Bur. 1143 Ahern's coll.*, June 1904, in flower, *For. Bur. 2164 Ahern's coll.*, Dec. 1904, in flower, *For. Bur. 2866, 2885 Ahern's coll.*, Mar. 1905, in flower, *For. Bur. 2987 Ahern's coll.*, Apr. 1905, in fruit: Province of La Laguna, *For. Bur. 17654 Curran, For. Bur. 15092 Cortes:* Province of Tayabas, *Merrill 1004 Garcia*, Aug. 1903, in flower and fruit, *Merrill 1073 Garcia*, Sept. 1903, in fruit, *For. Bur. 14989, 18645 Darling:* Province of Camarines, *For. Bur. 10691 Curran*, June 1908, in flower, *For. Bur. 12702 Rosenbluth:* Province of Albay, *For. Bur. 15083 Rosenbluth.* LEYTE, *For. Bur. 12733 Rosenbluth.* MINDANAO, District of Davao, *For. Bur. 11563 Whitford:* District of Zamboanga, *For. Bur. 9043 Whitford & Hutchinson.*

Common names: *karig* (Tag.), *aniga* (Ben.), *aningat* (Pang.), *dangi* (Riz.). *labang* (Iloc.), *karig* (Chab.), *saungan* (Leyte), *tapurao* (V.), *yacal blanco* (Tag.), *dagam* (Bicol), *duyong* (Tag.), *cariocan* (Tag.), *tiranlay* (Pang.), *putiyan* (Pang.), *banic* (Cag.).

2. **Vatica** sp. Yacal blanco.

This distinct form is represented by the following sterile numbers in our collection:

LUZON, Province of Tayabas, *For. Bur. 11509 Whitford*, June 1908: Province of Camarines, *For. Bur. 11521 Whitford*, June 1908. POLILLO, *Bur. Sci. 10783 McGregor*, Nov. 1909.

The leaves are much larger than those of *V. mangachapoi* and the petioles are rather dark-colored.

Seems to resemble *V. bantamensis*.

3. **Vatica** sp. Guisoc madlao.

This is represented by the following sterile material in our collection:

LEYTE, *For. Bur. 12781, 12782 Rosenbluth*, Feb. 1909.

The leaves are very large, oblong and distinctly yellow on the under side. They have some slight resemblance to the leaves of *V. rassak*.

4. **Vatica** ? sp. Calunti.

This is represented by three sterile specimens, collected by Whitford & Hutchinson on the Zamboanga peninsula.

The wood is soft and white and distinctly different from any other *Vatica* material which I have seen. The leaves rather resemble some of the *Pachynocarpus* material and they may belong in that genus.

MINDANAO, District of Zamboanga, *For. Bur. 9076, 9130, 9372 Whitford & Hutchinson*, Dec. 1907, Jan. 1908.

5. **Vatica** sp. **Baganauso.**

Leaves chartaceous, oblong, oblong-lanceolate or elliptic-oblong, 12 to 16 cm long, 5 to 7 cm wide, shortly acuminate at apex, rounded or cuneate at base; petioles 11 to 18 mm long; secondary nerves 14 to 15 pairs; margin of leaf slightly inrolled, and secondary nerves uniting near the margin of the leaf. Wood rather hard and very dark-colored, fine-grained, said to be more durable than *molave* (*Vitex parviflora* Juss.) and to be used for house-posts.

Represented in our herbarium by a single sterile specimen collected in the Province of Misamis, Mindanao, by Mr. Klemme, *For. Bur. 22465*.

Common name: *Baganauso* (Vis.)

SPECIES OF UNCERTAIN POSITION.

The following numbers apparently belong to this family; but, they are represented by incomplete material and I am unable to put them in genera:

For. Bur. 7580 Hutchinson, collected in Mindanao, in the Subprovince of Butuan and bearing the name of *magcasino*, has a wood like a red lauan; but the leaves seem to resemble a *Vatica* sp.

For. Bur. 7581 Hutchinson, collected in Mindanao, in the Subprovince of Butuan and bearing the name of *guisoy*, has a wood which is red and rather hard and fine-grained, like some species of *Shorea;* but the leaves have an appearance different from anything that I have seen in that genus.

For. Bur. 7583 Hutchinson, collected in Mindanao, in the Subprovince of Butuan and bearing the name of *dungon* or *dungon-dungon*, has a rather hard, fine-grained, red wood. The leaves have a shape very much like that of some species of *Dryobalanops*, but the venation is different.

Bur. Sci. 13141 Foxworthy & Ramos, collected near the Kabibihan River, in the Province of Tayabas, Luzon, in March 1911, under the name of *paina*. This number has immature fruit, unlike anything else that I have seen. The leaves and wood resemble *Hopea plagata*.

EXCLUDED SPECIES.

F.-Villar in Noviss. App. 20–21, credits *Shorea floribunda* Kurz, *S. parvifolia* DC., *S. reticulata* Thwaites, *Vatica grandiflora* Dyer, *V. scaphula* Dyer, *V. affinis* Thwaites, to the Philippines, but without citing specimens. It seems safe to assume that he was mistaken in crediting these species to the Islands.

ILLUSTRATIONS.

PLATE XXXIV. *Dipterocarpus pilosus* Roxb., showing flower and fruit. Bur. Sci. 13123 Foxworthy & Ramos. Photograph by Cortez.

XXXV. *Dipterocarpus affinis* Brandis, from Vidal's material in the herbarium at Kew. Photographs by Foxworthy.

XXXVI. *Dipterocarpus grandiflorus* Blanco, fruits collected in Negros to show variation in the development of the wings. Photographs by Martin.

XXXVII. *Dipterocarpus speciosus* Brandis, from Vidal 2160, in the herbarium at Kew. Photograph by Foxworthy.

XXXVIII. *Dipterocarpus* sp., showing old leaves, fruits and seedling. For. Bur. 12395 Curran & Merritt. Photograph by Cortez.

XXXIX. *Dipterocarpus* sp., showing old leaves and fruit. *For. Bur. 3223 Hagger.* Photograph by Cortez.

XL. *Anisoptera brunnea* Foxworthy. For. Bur. 11292 Klemme (type). Photograph by Cortez.

XLI. *Anisoptera curtisii* Dyer. Bur. Sci. 8085 Foxworthy. Photograph by Cortez.

XLII. *Hopea basilanica* Foxworthy. For. Bur. 15220 Klemme (type). Photograph by Cortez.

XLIII. *Hopea mindanensis* Foxworthy. For. Bur. 9029 Whitford & Hutchinson (type). Photograph by Cortez.

XLIV. *Shorea negrosensis* Foxworthy. For. Bur. 7281 Everett (type). Photograph by Cortez.

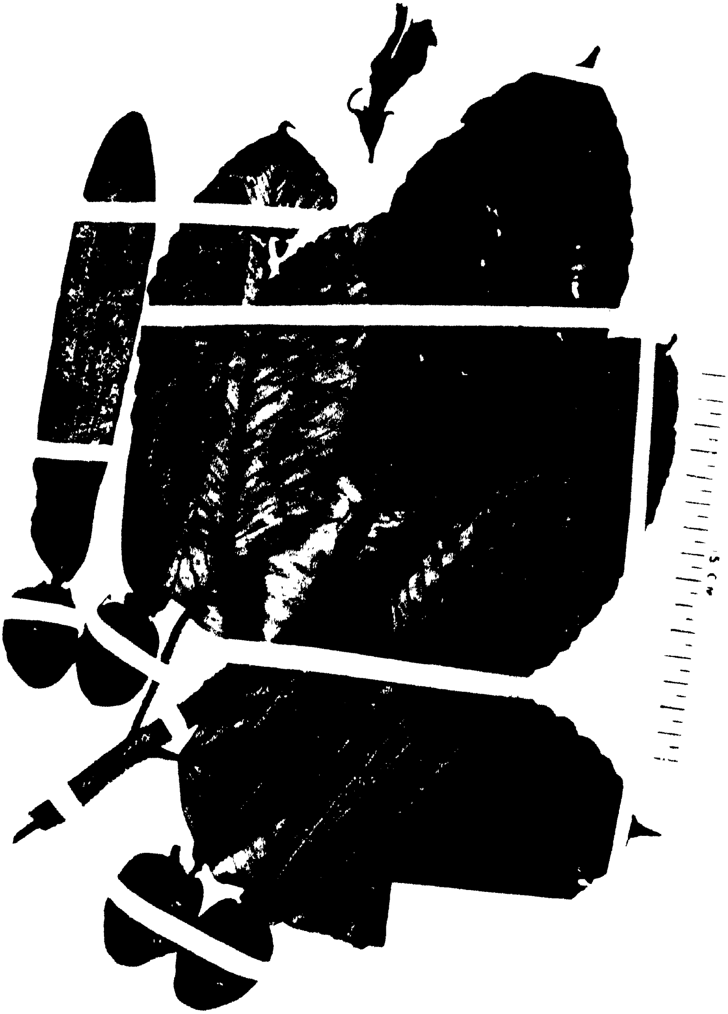

PLATE XXXIV. DIPTEROCARPUS PILOSUS ROXB.

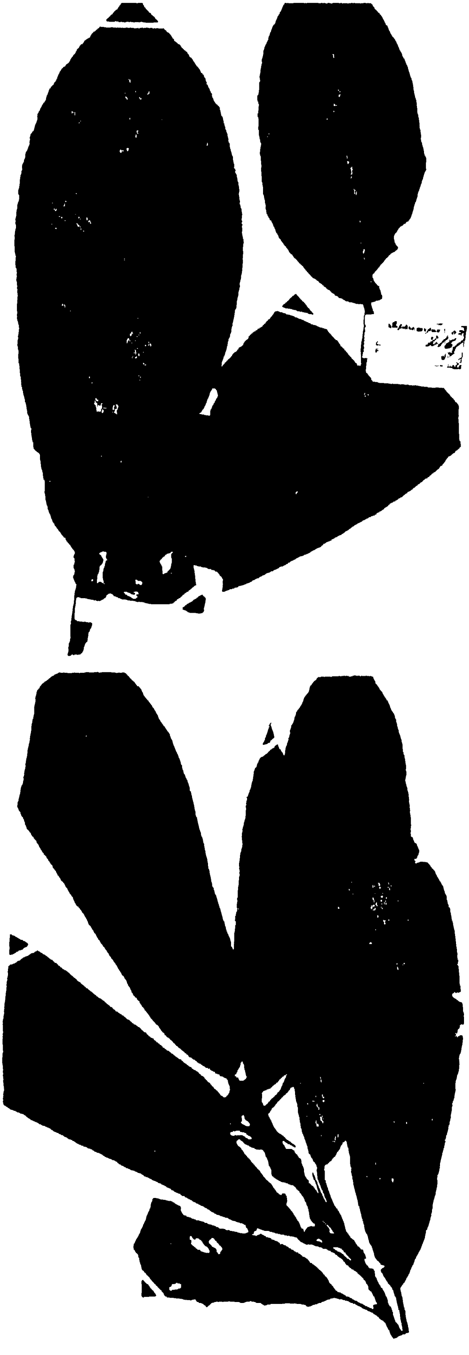

PLATE XXXV. DIPTEROCARPUS AFFINIS BRANDIS.

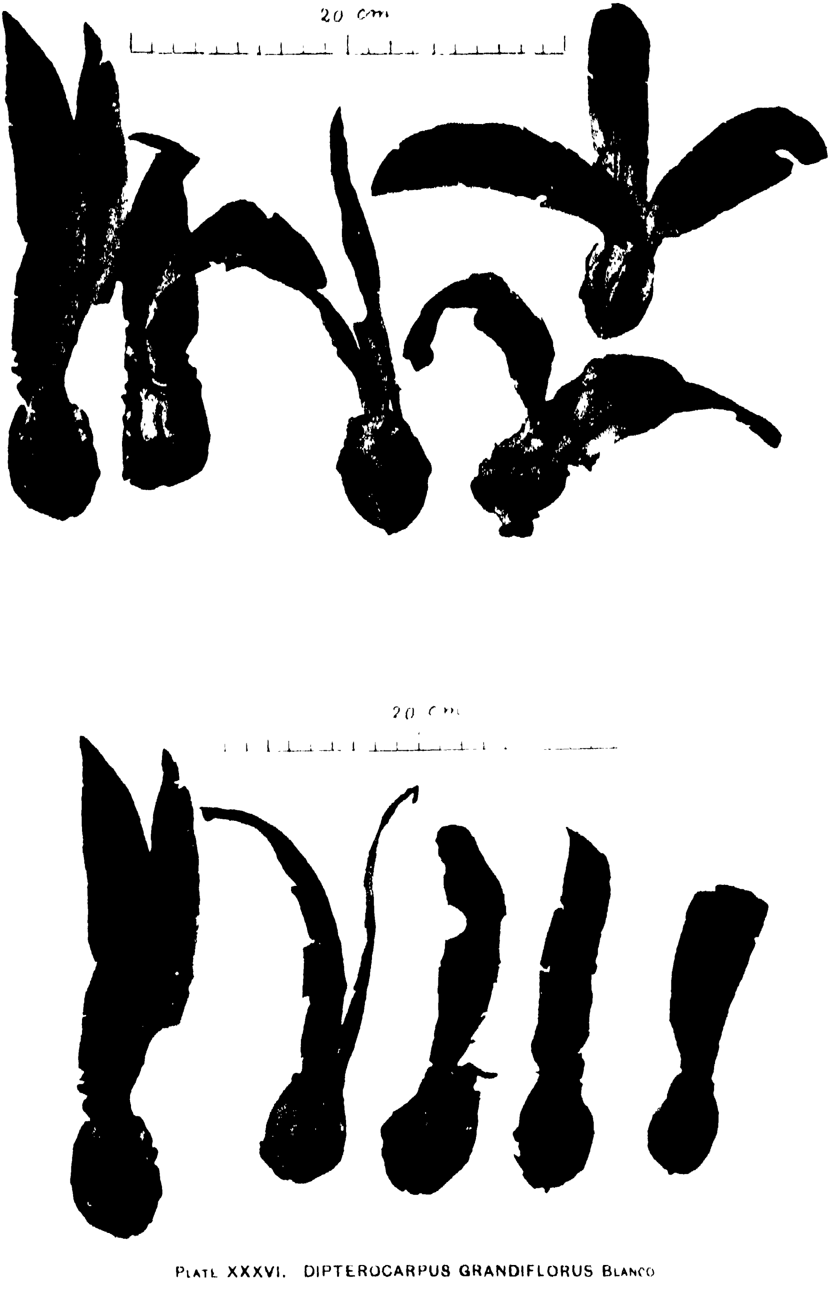

PLATE XXXVI. DIPTEROCARPUS GRANDIFLORUS BLANCO

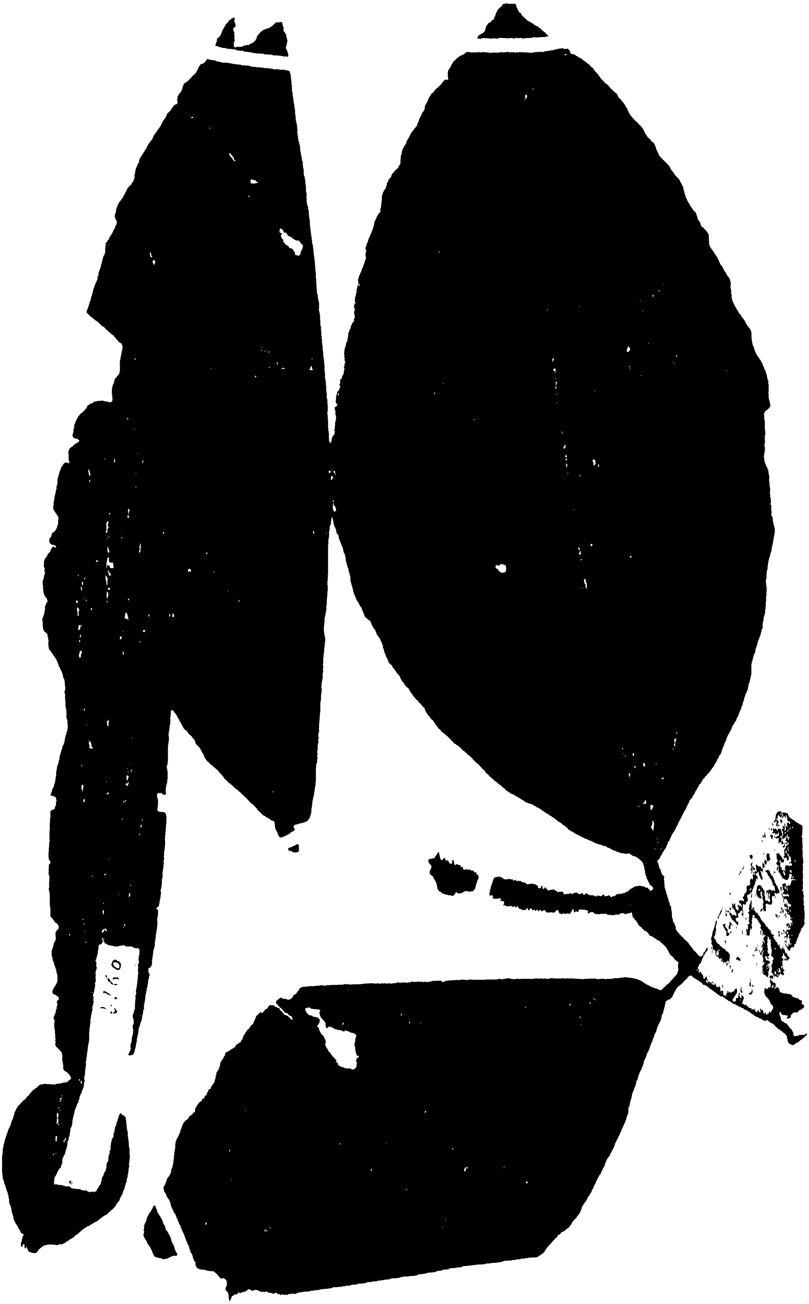

PLATE XXXVII. DIPTEROCARPUS SPECIOSUS BRANDIS.

PLATE XXXVIII. DIPTEROCARPUS.

PLATE XXXIX. DIPTEROCARPUS sp.

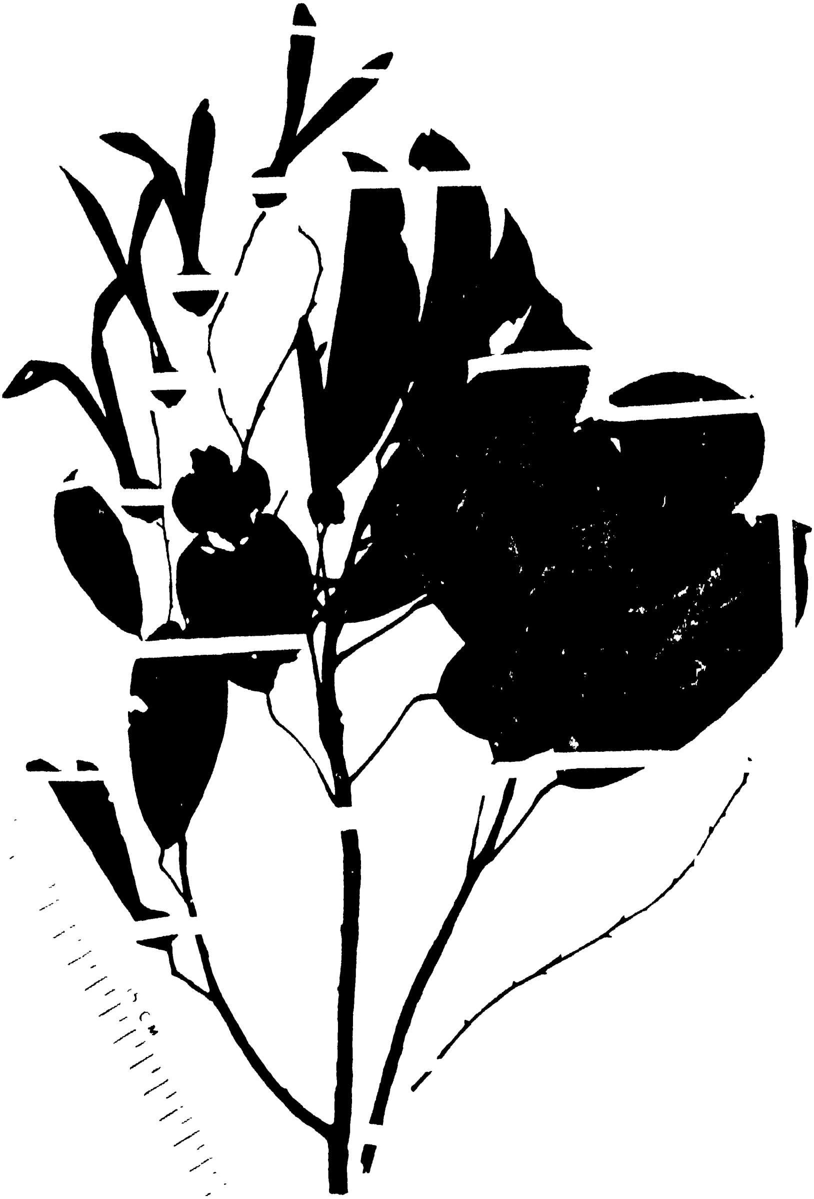

PLATE XL. ANISOPTERA BRUNNEA FOXW.

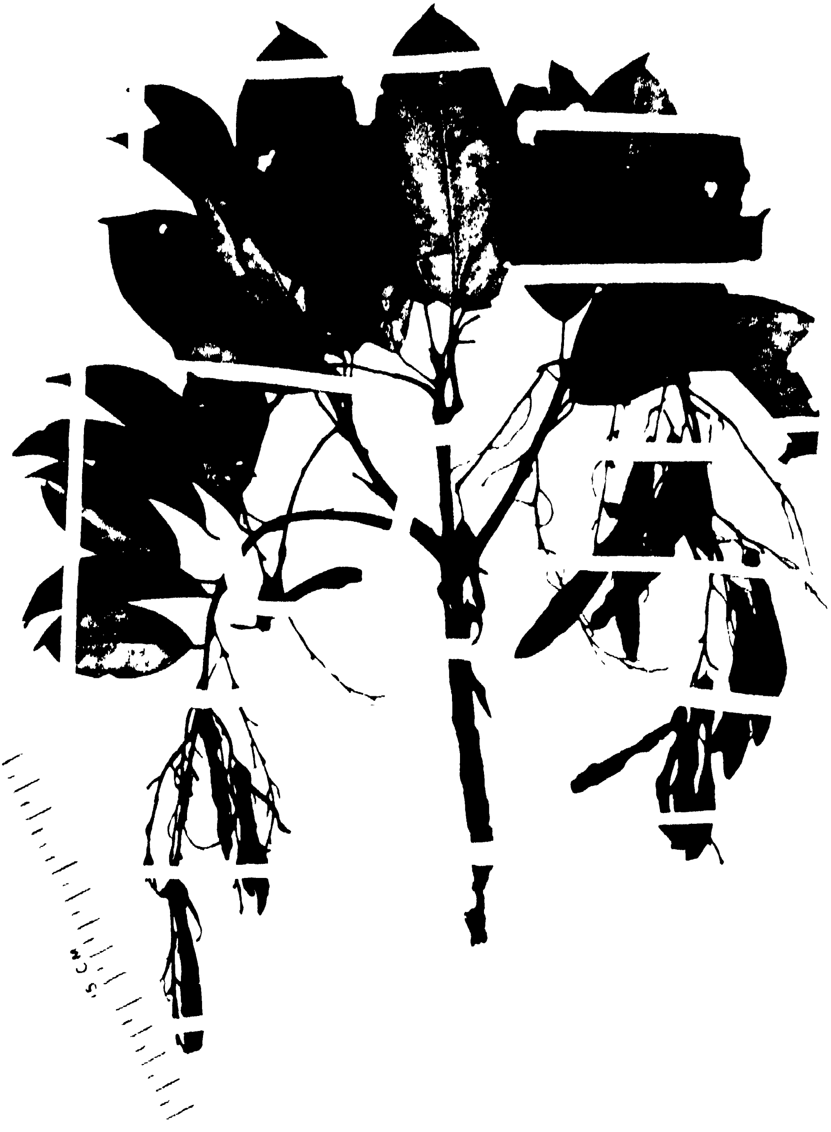

PLATE XLI. ANISOPTERA CURTISII DYER.

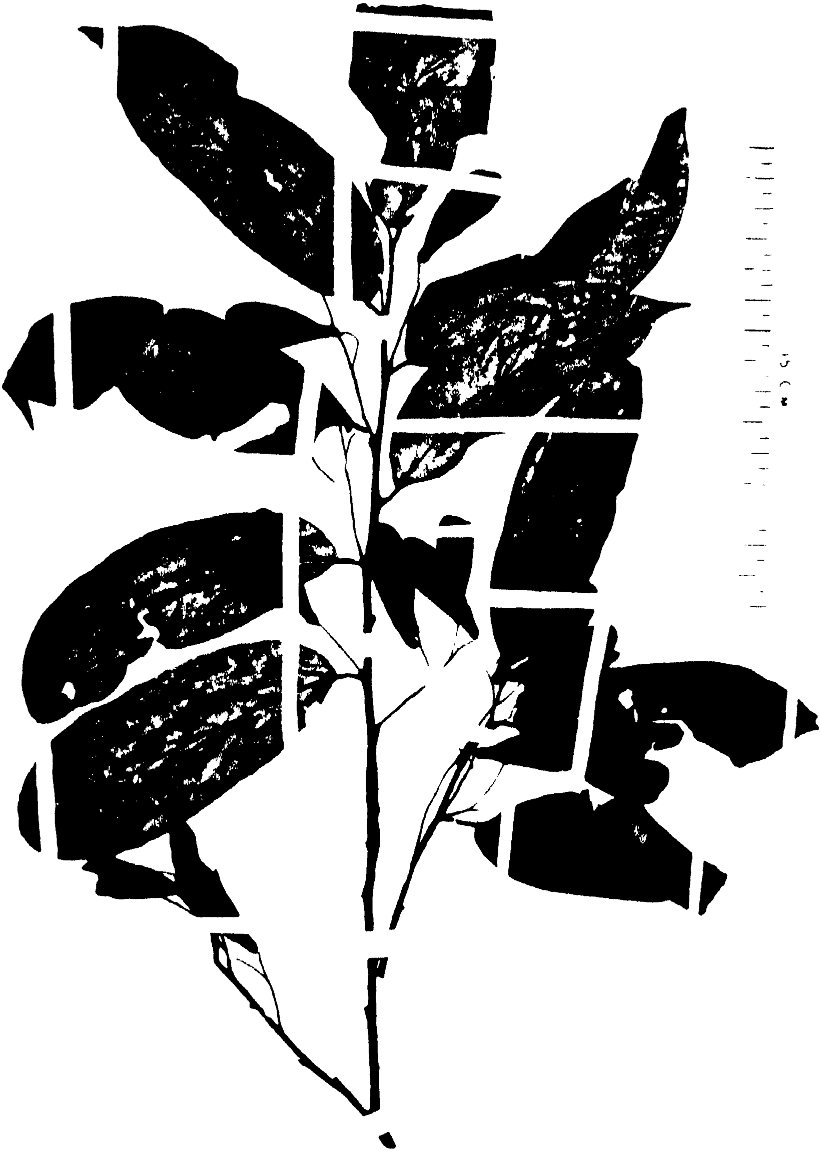

PLATE XLII. HOPEA BASILANICA Fo

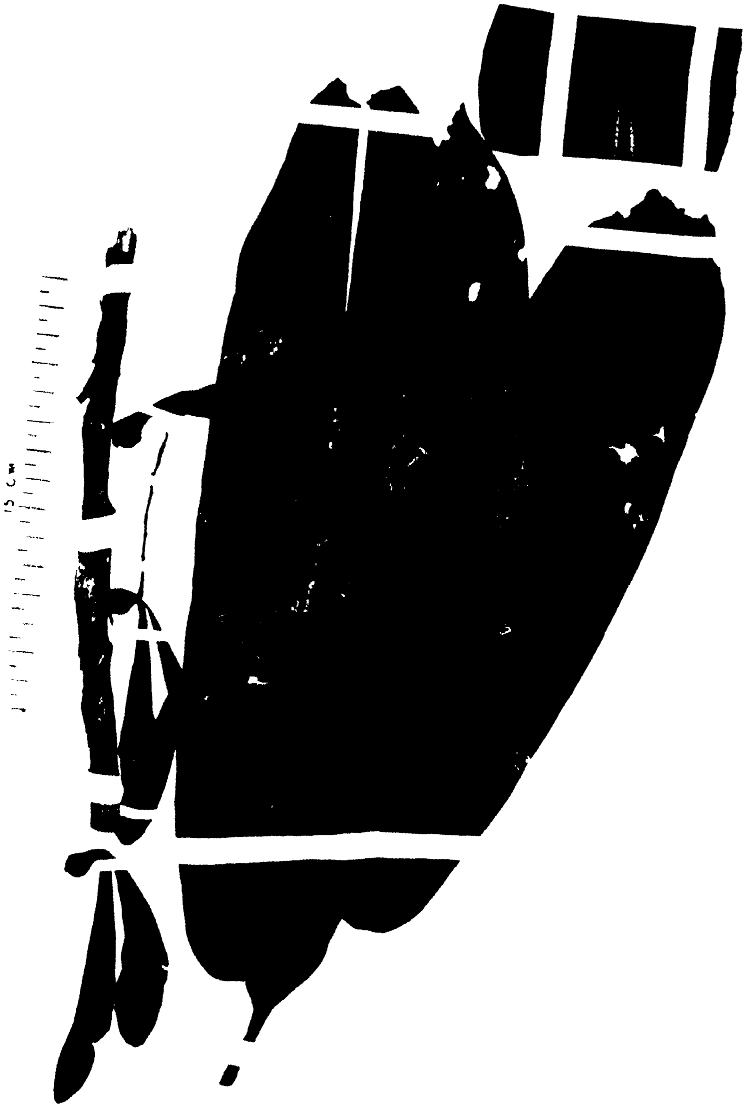

PLATE XLIII. HOPEA MINDANENSIS Foxw.

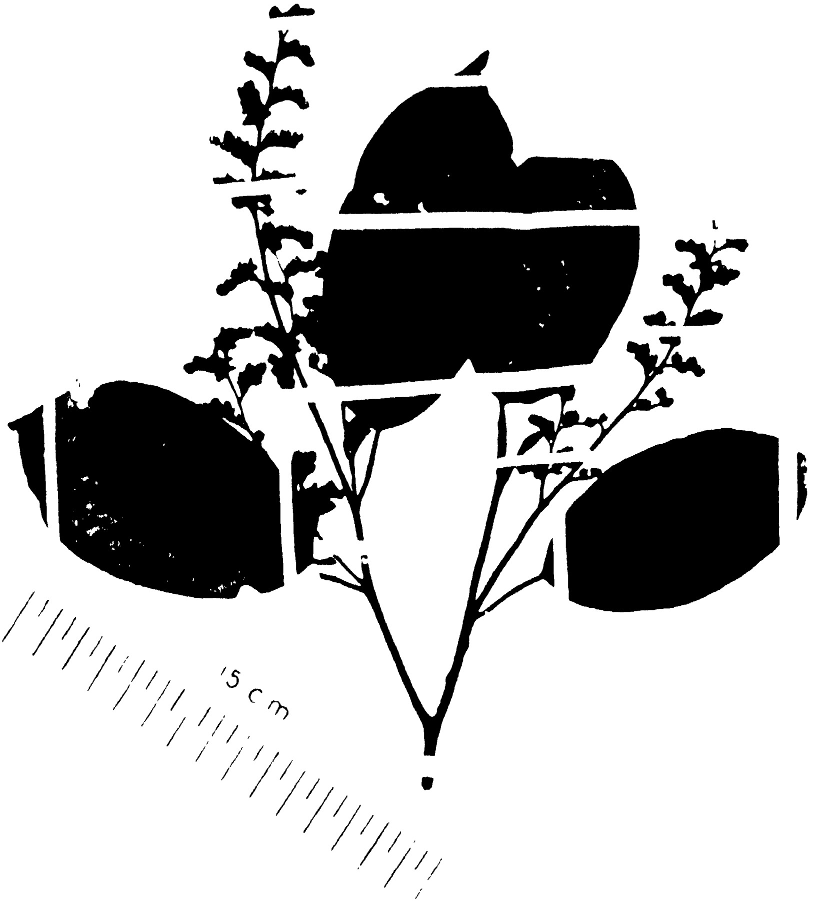

PLATE XLIV. SHOREA NEGROSENSIS Foxw.

The Philippine Journal of Science, C. Botany.
Vol. VI, No. 4, September, 1911.

A NEW SPECIES OF SCHIZOSTACHYUM.

By J. Sykes Gamble.
(*Highfield, East Liss, Hants, England.*)

Schizostachyum Fenixii Gamble sp. nov.

Frutex scandens. Folia chartacea, glabra, lineari-lanceolata, apice longe setaceo-acuminata, basi inaequaliter contracta et rotundata, marginibus scabra, 30 ad 35 cm longa, 4 ad 5 cm lata; nervi infra conspicui utrinque 10 ad 12; glandulae transversae conspicuae, obliquae; petiolus brevissimus corrugatus, vix 3 mm longus; vaginae striatae, ore auriculis rotundatis aliquando ad 5 mm longis et fimbriis albis saepe 7 ad 8 mm longis instructae; ligula brevis longe ciliata.

Flores in paniculis floriferis longissimis ramosis ramulis brevibus vix 8 ad 10 cm longis; rhachis gracilis conspicue puberulus, glomerulis ad nodos multifloris vaginatis; vaginae stramineae cito caducae. Spiculae uniflorae in glomerulis multae fertiles, 6 ad 8 mm longae, acuminatae, additis etiam multis imperfectis et bracteis pubescentibus glumaceis; glumae steriles 2 ovatae mucronatae, I 4 mm longa, nervis 9 et apice dense hirsuta, II 5 ad 6 mm longa, nervis 9 et apice parce hirsuta, marginibus ciliatis; florens 6 mm longa, margine ciliata enervis, glabra; palea convoluta, glabra, 7 mm longa, enervis; lodiculae 3, conspicuae, ovato-acuminatae, marginibus et dorso sericeo-villosae, 3 ad 4 mm longae. Stamina 6, linearia, libera, filamenta complanata, antherae 4 mm longae, basi inaequales, apice acumine conspicuo villoso, 2 mm longo munitae. Ovarium glabrum in stylum longum hirsutum attenuatum stigmatibus 3 recurvis plumosis. Caryopsis ovoideus 9 mm longus, 6 mm diametro, siccitate niger, apice mucronatus, basi glumis persistentibus suffultus; pericarpium tenue, facile solutum; semen pericarpio conforme, carnosum.

Luzon, Benguet Subprovince, Sablan, *E. Fénix*, December, 1910. A large quantity of material was collected which has been sent to Herr A. Kneucker, Karlsruhe, Baden, Germany, for issue in his "Gramineae Exsiccatae."

This species comes nearest to *Schizostachyum luzonicum* Gamble; its most prominent distinguishing characters are its larger leaves with large fringed auricles, and the long hairy anther-tips.

THE PHILIPPINE JOURNAL OF SCIENCE, C. BOTANY.
Vol. VI, No. 4, September, 1911.

URTICACEAE FROM THE SARAWAK MUSEUM.

By C. B. ROBINSON.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

At my request, Mr. J. C. Moulton, Curator of the Museum, Sarawak, Borneo, has permitted me to examine the collections in the possession of that institution belonging to this family. Among these are several species hitherto unreported from any part of Borneo. The comparison with Philippine species has shed considerable light on the affinities of the latter, for although specific identity between the plants of the family from the two countries is unusual, the general aspect of the Bornean plants is such that they might well have come from some unexplored locality in the southern Philippines. There are several undescribed species in the collection, but I have left these so whenever there seemed to be the least doubt, from the lack of staminate or pistillate material, as to the genus or the alliance within the genus.

FLEURYA Gaudich.

Fleurya interrupta (Linn.) Gaudich. Bot. Voy. Uran. (1826) 497.
Near Kuching, *Haviland;* Rejang.
Abyssinia to Polynesia.

LAPORTEA Gaudich.

There are in Philippine species two types of pistillate inflorescence. One is represented only by *L. luzonensis* Warb. and *L. anacardioides* C. B. Rob., with the possible addition of *L. venosa* Elmer, of which the pistillate inflorescence is unknown. In these the individual flowers are pedicelled, and the 4 perianth-segments are not exactly alike but can not be called strongly unequal, one pair is usually somewhat narrower than the other but with some variation in this respect. As for the pedicels, judging from herbarium material, they may or may not become succulent: when they do, pressure in drying may cause them to appear succulent or even winged. I have previously stated[1] that all our species belong in the section *Dendrocnide*, as limited by Weddell. This is correct, as *L.*

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[1] This Journal 5 (1910) Bot. 477.

anacardioides certainly belongs with *L. luzonensis,* which Weddell made a variety of *L. crenulata* Gaudich., and with the exception, probably temporary, of *L. venosa* there is no doubt concerning the others. On two adjoining attached fruits on the type sheet of *L. anacardioides* it is possible to get characters which if isolated would suggest three different sections. The perianth is subequal (§ *Dendrocnide*) ; the apical half of one pedicel is botuliform-thickened (§ *Sarcopus*) ; its basal half is cylindric (§ *Dendrocnide*) ; the other pedicel is flattened (§ *Sclepsion*). Taken in conjunction with other material, plates, and descriptions, it does not seem possible to retain these species in *Dendrocnide,* but there is not sufficient material here from outside regions to decide whether they might be placed under *Sclepsion* by enlarging its limits, or whether they should form a new section. As for our other species, they are all allied to *L. stimulans* (Linn. f.) Miq., and on a very extreme view might be made varieties of it, from deliberate judgment or more likely in despair, but assuredly no candid worker would take such a step without a determined attempt to find constant characters for separation, even (or, it may be, especially) if he had the Philippine collections alone. I am quite convinced that all the species indicated as distinct from one another in my recent paper are really so, except that *L. subpeltata* C. B. Rob., is almost certainly no more than an extreme form of *L. mindanaensis* Warb. On the other hand, two of these almost certainly extend to Borneo. But emphatic protest is made against placing *L. luzonensis* with *L. crenulata,* as was done by Weddell, or with *L. stimulans,* as suggested by Stapf,[2] in discussing material from Mount Kinabalu, duplicates of which are in the Sarawak Museum collections. Such of the Bornean plants as bear pistillate inflorescences come within the limits of *Dendrocnide,* but a staminate collection has certain other characters which indicate it as referable to a species of another section.

Laportea peltata (Bl.) Gaudich. Bot. Voy. Uran. (1826) 498.

Foot of Mount Braang, *Haviland 347*, staminate. The specimen agrees well with the descriptions of Weddell[3] and Smith,[4] but the leaves are rather obovate than ovate, and the basal nerves hardly reach beyond the middle of the leaf, differences which may be of little significance in the genus. The species is very distinct from any in the Philippines.

Java, Timor, not previously reported from Borneo.

Laportea lanaensis C. B. Rob. in Philip. Journ. Sci. **5** (1910) Bot. 483.

Limbang, *Hewitt.* The inflorescences are somewhat damaged, but the plant is a very close match for the type of the above species, except for slight differences in the stipules.

Mindanao.

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[2] Trans. Linn. Soc. Bot. II **4** (1894) 227.

[3] DC. Prodr. **16**^{1} (1869) 80.

[4] Koodr. & Val. Bijdr. Boomsort. Java **12** (1910) 678.

Laportea mindanaensis Warb. in Perk. Frag. Fl. Philip. (1903) 168.

Mount Kinabalu, at 5,000 feet elevation, *Haviland 1222*. This, referred by Stapf to *L. stimulans* Miq., is not typical of the above species, as the leaf-bases are more attenuate than is usual in Philippine material, and the venation is less arched, but some of our collections are nearly in agreement on the first of these characters and quite so on the second, while there seem to be no other differences.

Laportea sp.

Mount Kinabalu, Kadamaian, at 4,500 feet elevation, *Haviland 1230*. This is very close to *L. gracilipes* Elmer, but the leaf-bases are very acute, the veins more numerous, and the lowest of them less prolonged. *L. gracilipes* seems to approach closer to *L. stimulans* than does any other Philippine species, but seems to be a much more glabrous plant with smaller leaves less numerously veined, laxer inflorescence, and slightly shorter bracts.

Laportea sp.

Mount Kinabalu, Penokok, at 3,000 feet elevation, *Haviland 1331*, staminate, is probably the collection cited by Stapf as *1341*, as the locality and description entirely agree. This has some resemblance to *L. anacardioides* C. B. Rob., but is not close to it, and is still further removed from any other Philippine species.

Laportea sp.

Without locality, *Garai 991*, staminate, is quite distinct from any Philippine species, but resembles *L. mindanaensis* as much as any other.

Laportea sp.

Matang, at 2,000 feet elevaton, *Haviland 346;* Kuching. A third sheet, without attached data, might well be a duplicate of the first. This is vegetatively very similar to *L. subclausa* C. B. Rob., but has a very different pistillate inflorescence.

PILEA Lindl.

Pilea pterocaulis Stapf in Trans. Linn. Soc. Bot. II 4 (1894) 227.

P. crassifolia Stapf l. c. 228.

These are represented by the type collections from Mount Kinabalu, *Haviland 1229* and *1329*, the latter noted on the sheet as not the number cited by Stapf, *1339*, and are valuable here for the means afforded to compare them with two Philippine species, *P. benguetensis* C. B. Rob. and *P. intumescens* C. B. Rob. *P. benguetensis* has much resemblance to *P. crassifolia*, but the stems of the former are less angled toward the apex and not at all near the base, the petioles are shorter, the lamina much more inequilateral, triplinerved instead of trinerved, these nerves are not at all exserted and paler in color, the nervules connecting the costa with the lateral nerves are even more delicate than in *P. crassifolia*, and the leaf-apices are more falcate. In spite of all this, the species are closely allied.

P. intumescens has more superficial resemblance to *P. pterocaulis*, but is really much more widely separated from it than from *P. crassifolia*. From the former, it is distinguished by the shorter internodes, the more numerous ridges on the stem, absence of wings, longer petioles, and more serrate leaves. Compared with *P. crassifolia*, the internodes are of nearly equal length on the parts where direct comparison is possible, although shorter toward the base of the Philippine plant, the petioles of the latter seem stouter but in both cases give evidence of having been succulent, and the difference may have been brought about in drying. But the thinner (at least when dry) lamina of *P. intumescens* is longer, nearly always

but not always much more acute at the base, the apex is much more gradually contracted into the very distinctly longer acumen, the margins differ as the two original descriptions indicate, and the crenations of *P. crassifolia* are proportionally deeper, and the lateral nerves somewhat nearer the margin in that species. The most conspicuous difference is in the color of the dried leaves, which are darker on both surfaces of the Bornean plant, the under surface being brown or by means of the cystoliths somewhat golden-brown, the nerves nearly the same as the rest, whereas in *P. intumescens* the under surface is glaucescent, the nerves the same or with a reddish-brown tinge. It is possible that fuller collections might unite these two species, but on the material at present available they seem to be sufficiently distinct. *P. pterocaulis* has also much the appearance of *P. robinsonii* Elmer, but is much smaller, the leaf-margins are different, and the former is trinerved and the latter triplinerved.

Pilea johniana Stapf l. c. 227, *pl. XIX, fig. D, 17–26.*

Kinabalu, *Haviland 1391*, type collection. *P. humilis* C. B. Rob. differs distinctly by the larger, thinner, less crowded leaves.

Pilea rigidiuscula sp. nov.

Suffrutex (?), glaber: inflorescentiis pistilliferis quam petioli breves brevioribus; perianthii lobis 3, lateralibus quam intermedius multo minoribus: petiolis oppositis, saepissime uno quam alter sesquilongo, rarius conspicue inaequilongis vel aequilongis, laminis rigidiuscule chartaceis, anguste ellipticis vel lanceolatis, basi angustatis obtusis retusisque rarissime acutis, margine supra quintam basalem partem leviter dentatis, apice acuminatis, saepissime triplinerviis; stipulis parvis, orbiculari-triangularibus, caducis.

Pistillate inflorescences 3.5 mm long or less, the peduncles very short or practically none, very sparingly branched, few-flowered; pedicels very short: perianth-lobes 3, the intermediate oblong-lanceolate, 0.5 to 0.6 mm long, the laterals broadly ovate, about 0.3 mm long; achenes compressed-ovoid, more or less oblique, 0.8 mm long, papillose toward the margins.

From the material probably a low, branching undershrub; leaves opposite, the petiole of one of a pair more often about one and one half times the length of that of the opposed leaf, sometimes very unequal or almost exactly equal, 2.5 to 25 mm long, the lamina rigidly chartaceous, narrowly elliptic to lanceolate, 3 to 6.5 cm long, 1 to 2 cm wide, almost equilateral except sometimes at the extreme base, the base narrowed, obtuse and retuse or rarely acute, the margins except toward the base shallowly dentate, the apex forming an acumen similarly dentate about 6 to 8 mm long; usually definitely triplinerved, or the lateral nerves approaching the costa near the base and one or both continued to the petiole, or very rarely trinerved, the veins connecting the lateral nerves with the costa slender, about 10 in number but often connected with a slender intermediate nerve, the lateral nerves continuous to the base of the acumen; upper surface of lamina dull-green with greatly crowded conspicuous cystoliths, under surface much paler, with equally crowded but shorter and less conspicuous cystoliths; stipules orbicular-triangular, less than 1 mm long, caducous.

SARAWAK, Mount Koum, on limestone, *Kalong 1721*. The species seems to find much its closest ally in *P. rigida* C. B. Rob., of northern Luzon, both appearing to be small plants with stems woody at least at the base, small and similar leaves, and greatly reduced pistillate inflorescences. But the stems of *P. rigida* are strongly angled while those of *P. rigidiuscula* are terete, the leaves of the former are much more definitely trinerved and their leaf-margins more sharply toothed.

Pilea sp.

Mount Kinabalu, at 5,000 feet elevation, *Haviland 1305*, staminate. This is probably an undescribed species in the alliance of *P. melastomoides* (Poir.) Wedd., but the staminate inflorescences are much shorter than the petioles, the petioles are very long, the leaves large and wider proportionately than on any of the Philippine plants referred to that species, the leaves are almost 5-nerved, but the outermost pair is very much more slender than the inner and prolonged less than one-third the length of the leaf. The specimen hardly furnishes sufficient criteria of the comparative length of the petioles and size of the leaves.

ELATOSTEMATOIDES C. B. Rob.

Elatostematoides sp.

Niah, *Haviland & Hose 3318*. From its habit, this is almost certainly a species of this genus, but only staminate flowers are present, and there is no proof that it is not a *Pellionia*. The leaves are almost exactly the same as those of *E. thibaudianum* (Wedd.) C. B. Rob. (*Elatostema rostratum* Miq. non Hassk.), but the inflorescence is very different, borne on long branching peduncles instead of being sessile.

Elatostematoides sp.

Rejang, Belaga, *No. 2187*, collector not named on label, staminate. This has much resemblance to *E. robustum* (Hallier f.) C. B. Rob., differing in the larger, glabrous leaves, and the shorter stipules. It is probably an undescribed species, but is left with that status for the same reason as the preceding.

PROCRIS Commers.

Procris pseudostrigosa Elmer Leafl. Philip. Bot. 1 (1908) 284.

Kuching. Very typical, a nearly perfect match for many Philippine collections. The species appears to find its closest alliance in *P. frutescens* (Bl.) Wedd.

Philippines, Celebes.

Procris (?) sp.

Mount Kinabalu, at 3,500 feet elevation, *Haviland 1773*. Only staminate flowers are present, but the habit, the flowers and inflorescence, so far as they can, indicate the specimen to be of this genus, while it seems quite distinct from any published species.

ELATOSTEMA Forst.

Elatostema bulbothrix Stapf l. c. 230, *pl. XIX, fig. A, 1–4*.

Mount Kinabalu, at 10,000 feet elevation, *Haviland 1392*, type collection. In discussing the affinities of this species, Stapf suggests that in spite of its well-marked differences from anything previously described it may come nearest to *E. glaucescens* Wedd. He described the receptacles as sessile, but evidently refers only to the pistillate. Only one receptacle is present on the Sarawak Museum material, but it is staminate, borne upon a peduncle 3 mm long, pubescent like the stem, slender in contrast to the general thickened nature of the stems and leaves. The bracts are corniculate, the flowers tetramerous. All this is in line with Stapf's suggestion, except that other Philippine species come closer to *E. bulbothrix* than does *E. glaucescens*, although the texture of the leaves would keep it distinct from any of them even if there were no other characters. Probably its nearest allies are *E. heterophyllum* C. B. Rob., whose leaves have quite a different outline and margin, and *E. obovatum* Wedd. which has much larger and differently shaped leaves.

Elatostema lineare Stapf l. c. 228.

Mount Kinabalu, Kinitaki River, at 5,000 feet elevation, *Haviland 1271*, type collection. This at once suggests *E. pinnatinervium* Elmer, by reason of the pinnate leaf-venation, but the leaf-outline is very different, and the staminate receptacles of *E. pinnatinervium* are peduncled while those of *E. lineare* are sessile. The leaf resemblance is much closer with an undetermined specimen from Polillo, *Bur. Sci. 9195*, but the leaf-teeth of the latter are more deeply cut, and the stipules of the Bornean plant are longer than those of either the Polillo plant or of *E. pinnatinervium*.

Elatostema lithoneurum Stapf l. c. 230, *Pl. XIX, fig. C. 9–16.*

Mount Kinabalu, at 11,000 feet elevation, *Haviland 1206*, type collection. The specimen has much external resemblance to *E. palawanense* C. B. Rob. The leaves are similar in outline and margin, but wider on the Philippine plant, whose narrowest are of about the width of the widest of the Bornean, they are also more definitely oblanceolate or obovate than the latter. Further, the upper surface of the leaves of *E. palawanense* is scabrous, while the pubescence of *E. lithoneurum* is much more scattered, the hairs somewhat longer, the surface not at all scabrous. The under surface of the Palawan leaves is also much more densely pubescent, with this pubescence glaucescent, much paler than on the Bornean plant. The lateral veins of the latter leave the costa at a smaller angle. Finally, the staminate receptacles of *E. lithoneurum* have rather long and slender peduncles, but some young ones in the upper axils are sessile, and this was the state in which the Palawan plant was found.

Several of these differences bring *E. lithoneurum* close to *E. lagunense* Merr., the nearest Philippine alliance of *E. palawanense*, but that is a much coarser plant, with the staminate receptacles sessile or on short stout peduncles, the leaf-teeth are coarser, and the terminal acumen much more prolonged.

The series of *E. lithoneurum*, *E. palawanense*, *E. lagunense*, links through the last with *E. paludosum* Miq., as represented by *Hallier 396*, Tjibodas, Java, this species in its turn having been reduced by Weddell[6] to the status of a variety of *E. macrophyllum* Brongn. The case between *E. lagunense* and *E. paludosum* is very critical indeed, but the former has much more continuous leaf-nerves, the leaves themselves are larger, and the stipules somewhat longer. It is difficult to decide positively upon a single collection, and our specimen of the Javan plant is sterile, but the two species may prove to be incapable of separation. Between *E. paludosum* and *E. macrophyllum*, the differences are quite sufficient for them to be held apart specifically, if the former is adequately represented by the specimen above cited, and the latter by *Hallier 374*, Buitenzorg, Java. *E. macrophyllum* is described as penninerved, which agrees well with the specimen, but the same can not be said of *Hallier 396*, as the basal nerves are distinctly the longest, especially on the narrower side of the leaves. Hallier's specimen of *E. paludosum* is much more pubescent than his of *E. macrophyllum*, but from Miquel's description the leaves of the former are more pubescent than those of the type of the species.[6] The leaves of *E. lagunense* also vary in pubescence, but in that species the explanation in at least some cases is humidity and not age. The stipules of *E. macrophyllum* are 3 mm long, those of *E. paludosum* only 1 mm long. The staminate receptables of *E. lagunense* are usually much larger than those of *E. paludosum* are said to be by Miquel, but they must vary in this respect with age, and this difference would have to be verified by very full collections before it could be used as a positively discriminating character.

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[6] DC. Prodr. **16**^{1} (1869) 174.

Perhaps the closest leaf-similarity of all between *E. lithoneurum* and any Philippine species, is with one from Mount Tonglon, Benguet, *Phil. Pl. 812 Merrill*, which will be described as new,[7] but the Benguet plants have not only densely pubescent stems but the staminate receptacles are either shortly and stoutly peduncled or subsessile.

Elatostema thalictroides Stapf l. c. 220, *pl. XIX, fig. B, 5–8.*

Mount Kinabalu, at 5,000 feet elevation, *Haviland 1219.* As already surmised,[8] this is a very real alliance for *E. halconense* C. B. Rob., but the latter is a coarser plant with stems and branches of a yellowish or grayish color, while those of *E. thalictroides* are rather dark-reddish. Except for the ultimate branchlets, which are very densely pubescent in both species, *E. halconense* is distinctly the more pubescent. The leaves are of different outline, longer and narrower in *E. halconense*, with the apical tooth much farther prolonged. *E. sublignosum* C. B. Rob. and *E. baruringense* Elmer are progressively more distinct from *E. thalictroides* than is *E. halconense*. *E. podophyllum* Wedd., although having leaves with a distinctive base and outline, is also in the same alliance.

Elatostema sp.

Niah, *Haviland & Hose 3317*, with pistillate receptacles which although very young are sufficient for positive generic determination. The alliance is probably with *E. procridioides* Wedd., but no staminate receptacles are present, making a positive statement impossible.

Elatostema sp.

Mount Braang, on limestone, *Haviland 637*, also without staminate receptacles. It has much the appearance of being a reduced state of *E. luzonense* C. B. Rob., but with this difference, that when the leaves of that species become reduced they take on a different form either from those of better developed plants of the same species or of those of the Bornean collection. There are no opposing leaves of smaller size than the others, the characteristic of *E. surculosum* Wight, and the leaves are smaller than those of *E. sikkimense* C. B. Clarke, resembling rather those of *E. glaucescens* Wedd., a species which differs in pubescence and in various other ways.

POUZOLZIA Gaudich.

Pouzolzia zeylanica (Linn.) Benn. Pl. Jav. Rar. (1838) 67.

Niah, *Haviland & Hose 3319*; Rejang.

Tropical Asia and Malaya.

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[6] Pl. Jungh. (1851) 19.

[7] See below, page 306.

[8] This Journal 5 (1910) Bot. 542.

PIPTURUS Wedd.

Pipturus arborescens (Link) C. B. Rob. in Philip. Journ. Sci. 6 (1911) Bot. 13.

Paku, Saribas, *Haviland & Hose 3320*. Not a very typical form, resembling most among Philippine collections those from Palawan and some of those from Bataan.

Philippines.

Pipturus argenteus (Forst.) Wedd. in DC. Prodr. 16[1] (1869) 235[19].

Niah, *No. 3321*, collector not named. This like the Philippine material so identified does not agree with the description of the species in that the spikes are shorter than the petioles, but this can hardly be considered a serious objection.

Sumatra to Australia and Polynesia.

Pipturus repandus (Blume) Wedd. in Arch. Mus. Paris 9 (1857) 448.

Foot of Matang, *Haviland 362*. A broad-leaved form, but no more so than several of the Philippine collections so identified.

Java, Philippines.

OREOCNIDE Miq.

Oreocnide trinervis (Wedd.) Miq. Fl. Ind. Bat. 1[2] (1859) 270.

Near Penkuler Ampat, *Haviland 765*.

Philippines, Formosa.

LEUCOSYKE Zoll. & Mor.

Leucosyke capitellata (Poir.) Wedd. in DC. Prodr. 16[1] (1869) 235[27].

Penkuler Ampat, *Haviland 350*. Like many of the Philippine collections, especially of those from the southern Islands: very likely var. *villosa* (Bl.) Wedd.

Java to the Moluccas and Formosa.

ASTROTHALAMUS C. B. Rob.

Astrothalamus reticulatus (Wedd.) C. B. Rob. in Philip. Journ. Sci. 6 (1911) Bot. 19.

Foot of Matang, *Haviland 351*; Buseau, on limestone, *Haviland 352*.

Mariannes, Philippines.

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PHILIPPINE URTICACEAE, II.

By C. B. ROBINSON.

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Somewhat intensive botanical explorations have recently been made in Benguet, and among the collections are representatives of several species not previously obtained. This has also furnished an opportunity to make detailed investigations upon various points, where abundance of herbarium material furnishes controls, so that the results obtained can be checked by many workers. Somewhat unexpectedly, although it should not have been, one collection has rendered necessary a complete revision of the statements which have been made in many works regarding the genus *Pipturus*. Less numerous collections have been received from other parts of the Islands. Nothing is herein cited unless some light has been thrown upon the species concerned. The numbers placed with the species indicate their sequence in comparison with those enumerated in my previous paper.

9. ELATOSTEMA Forst. p. p.

In this genus the need for characters that can be depended on as constant is very great. For this reason, a test has been made of the reliability of tetramerous as contrasted with pentamerous staminate flowers. Practically no attention has been paid to this in the past, most workers recording the facts as a matter of routine in describing species, but no one basing conclusions upon them. This is used in *Pouzolzia* and *Gonostegia* (*Memorialis*) as one of the main bases of separation,[1] but so far as Philippine experience goes, it is less constant in these genera[2] than in *Elatostema*. Much of the material examined was hardened in alcohol while fresh, the remainder was taken from dried plants. The results are as follows:

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[1] Hook. f. Fl. Br. Ind. 5 (1888) 580.

[2] See This Journal 6 (1911) Bot. 8, 10.

Collection number.	Species.	3-merous.	4-merous.	5-merous.
Merrill 7627	*E. filicaule*		45	1
Phil. Pl. 805	*E. podophyllum*		67	2
Merrill 7629	*E. benguetense*	1 (?)	60	
Bur. Sci. 14004	*E. lutescens*		100	
Merrill 7643	*E. lutescens*		100	
Merrill 7645	*E. scapigerum*		50	
Merrill 7641	*E. glomeratum*		50	
Merrill 7647	*E. merrillii*			35
Merrill 7640	*E. variabile*	2	148	
Merrill 7644	*E. purpureum* var.		100	
Bur. Sci. 13475	*E. discolor*			11
Phil. Pl. 812	*E. purpureum*		50	
Merrill 7634	*E. plumbeum*		48	
Bur. Sci. 14134	*E. luzonense*		100	
Bur. Sci. 9920	*E. glaucescens*		80	
Mrs. Clemens 411	*E. lagunense*		50	
Bur. Sci. 9907	*E. lagunense*		60	
Bur. Sci. 9760	*E. scriptum*		20	
Merrill 7516	*E. banahaense*		40	
Bur. Sci. 3609	*E. edule*		20	
For. Bur. 3266	*E. angustatum*		45	

So far as this is a sufficient test, the character seems reliable. It may be added that where different collection numbers have been referred to the same species, their flowers agree in this respect in almost every case investigated. The only exception known to me is with *E. podophyllum* Wedd., normally tetramerous. Two collections so identified, *Merrill 6171* and *Bur. Sci. 9356*, have been noted on the sheets as pentamerous. Further examination of the former showed that of two flowers dissected one was tetramerous and one pentamerous; the latter was preponderatingly pentamerous, four receptacles giving 22 pentamerous flowers and only 3 tetramerous. There are four other Philippine species about which discordant statements have been made. *E. simulans* was described[3] as tetramerous or pentamerous, dissection of six additional flowers showed that they at least were all pentamerous. Mr. Elmer's examination of the flowers of *E. philippinense* disclosed both numbers, mine showed five only.[4] Similarly in *E. spinulosum*, he found trimerous as well as tetramerous flowers, I found the latter number only.[5]

Finally, Weddell calls *E. longifolium* doubtfully tetramerous.[6] Eleven flowers were examined from one receptacle of the broad-leaved plant of *Cuming 456*, ten were pentamerous, the eleventh was in poor condition but probably tetramerous; 20 flowers from one receptacle of *Bur. Sci. 8186*, a good but not perfect match for Cuming's plant, were all pentamerous. Adding *E. pinnatinervium* and *E. variabile*, both tetramerous, and other species herein and previously described, there are now known in the Philippines 31 species with tetramerous flowers, 9 with pentamerous flowers, while those of 8 species are still unknown. Decision upon the relative importance of the character will depend largely upon the opinions held of the nature of the 31 and the 9 respectively, so far at least as our species are concerned, and it must be confessed that the weight of previous opinion regarding these or those most similar to them, would not set much value upon it. Yet it does separate 9 species, five of them having much similarity to one another, while the other four, *E. simulans, E. longifolium, E. obtusiusculum*, and *E. contiguum* have a different appearance from the other four but again much resemblance to one another. Much work must be done upon species of other countries before a final opinion can be passed.

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[3] This Journal **5** (1911) Bot. 519.

[4] Leafl. Philip. Bot. **3** (1910) 888; This Journal **5** (1911) Bot. 524.

[5] Leafl. Philip. Bot. **2** (1908) 468; This Journal **5** (1911) Bot. 530.

[6] DC. Prodr. **16**[1] (1869) 184. See below, page 303.

10a. **Elatostema discolor** sp. nov.

Caulibus basi repentibus, appresse-pubescentibus: receptaculis staminiferis sessilibus, bracteis ovatis, vix corniculatis; floribus pentameris: foliis discoloribus, parvis, oblique obovatis vel late oblanceolatis, lateris latioris basi auriculatis, supra medium grosse dentatis, subtrinerviis.

Staminate receptacles sessile; outer pair of bracts of the larger receptacles ovate, about 2.5 mm long, only very obscurely corniculate, ciliate on the apical half of the margins and especially at the apex, often also with yellowish-brown pubescence on the dorsal surface or with cystoliths, inner pairs of bracts similar, about 2 mm long; bracteoles oblanceolate, about 2 mm long, densely ciliate toward the apex; pedicels of mature flowers about 2 mm long; perianth-segments 5, oblong, oblong-oblanceolate, or broadly lanceolate, about 2 mm long, ciliate on the apical half of the margins and especially at the apex; filaments about 2 mm long; anthers white, the cells widely separated at the base, less than 1 mm long.

Stems 15 to 35 cm long, creeping and rooting near the base, and there often branching, the leaf-bearing parts erect or suberect, rarely branched, the stems densely covered with appressed, apically directed, strigose, yellowish pubescence; leaves subsessile, the lamina obovate or broadly oblanceolate, the lowest often reduced in size, the others 15 to 27 mm long, 7 to 12 mm wide, strongly inequilateral especially at the base, the narrower side obtuse, the broader side produced into a short auricle, both margins usually with 3 teeth of comparatively large size, or the wider side with 4 or the narrower with 2, the apical tooth 4 mm long, or less, lanceolate to ovate, not projecting beyond the general outline; upper surface plumbeous, under surface yellowish-green, the upper with a few, scattered, long hairs or glabrous, and with densely crowded cystoliths, the margins with similar hairs or glabrous, the veins of the under surface appressed-strigose; almost or quite trinerved, the nerves extending to the base of the lamina, auricle excluded, but on the wider side of the wider leaves little longer than the succeeding, other veins usually 3 on each side, sometimes 2 or 4, minor venation hardly conspicuous; stipules narrowly lanceolate to ovate, 1 to 1.8 mm long, with crowded cystoliths and sometimes ciliate.

LUZON, Subprovince of Benguet, Baguio, in ravines at about 1,400 m elevation, *Bur. Sci. 13475 Ramos*. Superficially, the species has more the appearance of *E. podophyllum* Wedd. than of any other hitherto found in the Philippines, but differs widely from it in the slender stem, wider, larger and more deeply cut leaves, stronger and somewhat different venation, and the absence of the typical leaf-base. It is really in the alliance of the species from *E. aerophilum* to *E. hastatum*, and on a summary of characters probably closest to *E. philippinense* Elmer, from which it differs by its more densely pubescent stem, and the shape, color, comparatively deeper and much coarser dentation, and venation of the leaves. It has also much resemblance to *E. hookerianum* Wedd., but that has the stems, staminate bracts, and bracteoles glabrous, these bracts are more corniculate, the leaves are usually more acuminate, with different venation, and longer stipules. Probably the closest alliance of all is with *E. obliquifolium* Reinecke, of Samoa, the name indicating one difference. The Philippine plants are larger with larger leaves, the Samoan have peduncled staminate receptacles.

5. **Elatostema filicaule** C. B. Rob. in Philip. Journ. Sci. **5** (1911) Bot. 516.

Additional collections, *Merrill 7627*, from mossy forest on Mount Tonglon, Benguet, and *Phil. Pl. 802 Merrill*, from mossy forest at Pauai, Benguet, both growing at about 2,200 m elevation, and reëxamination of the type material, show that in the smaller-sized receptacles only one of each of the two inner pairs of staminate bracts may be developed. The larger-sized receptacles are of the type common to the genus. The species is, in all probability, a very primitive form. Pistillate flowers have not yet been collected.

31a. **Elatostema glomeratum** sp. nov.

Erectum, succulentum: receptaculis staminiferis glomeratis, bracteis haud vel vix corniculatis; floribus tetrameris: foliis siccis subchartaceis, elliptico-oblanceolatis vel elliptico-obovatis, basi utrinque acutis vel latere latiore obtusis, margine basin versus excepto dentatis, apice breviter acuminatis, triplinerviis.

Staminate receptacles sessile in clusters of 6 to 20 or more, but each retaining the structure typical of the genus; outer pair of bracts orbicular or broadly obovate, rounded at the apex, very shortly or not corniculate, 2 to 2.5 mm long, ciliate or ciliate-serrate on the margins and shortly pilose on the dorsal surfaces; inner pairs broadly oblanceolate, 2 mm long, shortly corniculate, pubescent like the outer; bracteoles narrowly oblanceolate, 2 mm long, densely pilose on the costa and at the apex; pedicels about 0.5 mm long; perianth-segments 4, lanceolate or oblong-lanceolate, the outer pair slightly longer than 1 mm and densely ciliate on the apical halves of the margins and at the apex, the inner pair slightly shorter than 1 mm and less densely ciliate than the outer, all shortly corniculate; filaments 1 mm long; anthers white, about 0.5 mm long.

the cells often unequal, approximate at the base: pistillate receptacles unknown.

Stems erect, 25 to 45 cm high, more often simple, or sparingly branched especially at the base, grooved, densely antrorsely grayish-strigose: leaves with petioles 5 to 8 mm long, similarly pubescent, lamina when dry subchartaceous or chartaceous, elliptic-oblanceolate or elliptic-obovate, 5.5 to 10.5 cm long, 2 to 4 (usually 2.5 to 3) cm wide, acute at the base on both sides or on the wider side obtuse, the margins dentate on both sides but not deeply, the teeth of the wider side from about 22 to 30, of the narrower 20 to 24, the apex except on reduced leaves definitely contracted into an acumen 5 to 15 mm, more often about 10 mm long; upper surface glabrous with numerous but inconspicuous cystoliths, under surface appressed-strigose on the veins; triplinerved, the nerves extending four-fifths the length of the lamina or often to the base of the acumen, other veins projecting on the under surface, on each side of the costa more often 3 or 4 but with others of about equal number nearly as prominent, reticulations lax, conspicuous; stipules lanceolate to ovate, 2 to 2.5 mm long, acute, pubescent.

LUZON, Subprovince of Benguet, Baguio, on wet ledges in ravine, *Merrill 7642* (type); Mount Tonglon, mossy forest at about 1,900 m elevation, *Phil. Pl. 810 Merrill*, ravines on banks of small stream at about 1,800 m elevation, *Merrill 7641*. Among Philippine species, this has its closest alliance with that here identified[7] as *E. longifolium* Wedd., differing from it by the clustered staminate inflorescence, pubescence, leaf-bases and serration. It may also be near *E. sessile* var. *punctatum* Wedd., but the receptacles in the present case while numerous and often very small are each complete, whereas in the Indian plant, Weddell states that the fasciculate appearance of the (pistillate) receptacles is illusory, the receptacles being in reality deeply lobed.[8] In *E. glomeratum*, the elements of the receptacle are unusually loosely attached to one another.

31. **Elatostema longifolium** Wedd. in Ann. Sci. Nat. IV 1 (1854) 189; DC. Prodr. **16**^{1} (1869) 184; C. B. Rob. in Philip. Journ. Sci. **5** (1911) Bot. 534. Type, *Cuming 456*.

Attention has previously been called to the Cuming specimen in this herbarium, and all identifications here have been based on the broad-leaved plant on our sheet. The difficulties are these. The name is inappropriate; the leaves are not elongate-lanceolate; those on our sheet are 27 to 37 mm wide; the base of the leaves can not be called acute; the stipules are not long-persistent; the staminate flowers are pentamerous instead of doubtfully tetramerous, there being little mechanical difficulty in ascertaining the fact. Most of all, I do not see why Weddell would not have made it a variety of *E. sessile*, when he so treated *E. ulmifolium* Miq., which is a very near ally of the Philippine plant, to say nothing of *E. brongniartianum* Wedd., which is much further from *E. sessile* than is *E. ulmifolium*. This has led to the suspicion that this broad-leaved plant is really *E. tomentosum* Wedd., afterwards placed by him next to *E. ulmifolium*, both as varieties of *E. sessile*. This is still conjecture, for although the botanists of Kew and Paris have most courteously searched their herbaria and even attempted to get light from those of other institutions, *E. tomentosum* has not been found.

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[7] See This Journal **5** (1911) Bot. 534; also below.

[8] DC. Prodr. **16**^{1} (1869) 173.

Weddell compares *E. longifolium* with *E. lineolatum* Wight, and the narrow-leaved plant of Cuming's collection does approach closely in habit to some collections of that species. Until now, there has been nothing here to match this narrow-leaved plant with any reasonable probability of identity. The want seems to be supplied by *Bur. Sci. 13108 Foxworthy & Ramos*, from Guinayangan, Tayabas, which has just about the appearance that an apparently immature plant such as that of Cuming might be expected to assume. Differences can easily be found; the stems are less pubescent, the longest leaf is 18 cm long but is little over 2 cm in width, the widest slightly exceeding 2.5 cm, and these longer leaves have more numerous teeth and veins, yet the leaves which have the same size as those of Cuming's collection are practically identical with them in these and all other characters. The alliance suggested by habit is no longer with *E. lineolatum* Wight, but through intermediates in *E. banahaense* and *E. carinoi* with *E. sessile*. Yet even between the three Philippine species, the stipules alone are sufficient for discrimination. These stipules are much in evidence on *Bur. Sci. 13108*; its staminate flowers are tetramerous.

28a. **Elatostema lutescens** sp. nov.

Herba succulenta, E. viridescenti Elmer similis, sed differt foliis multo minoribus, latere angustiore magis dentatis, stipulis brevioribus, receptaculorum staminiferorum bracteis minus corniculatis: receptaculis sessilibus vel brevissime pedunculatis; floribus staminiferis tetrameris.

Staminate receptacles very shortly peduncled or sessile, completely inclosed beneath by the outer pair of bracts, the latter glabrous, in well-matured receptacles 3.5 mm long, 5 to 6 mm wide, broadly rounded at the apex, the spur thickened at its apex but barely projecting beyond the general outline of the bract; inner two pairs of bracts 2.5 mm long, 3.5 mm wide, their margins broadly hyaline, the costa thick but not becoming free nor reaching the apex of the bract, glabrous; bracteoles cuneate-oblanceolate, about 2.5 mm long: flowers on pedicels about 2.5 mm long; perianth-segments 4, shortly and irregularly or not corniculate, 1.5 mm long, the outer pair oblong-ovate, glabrous, the inner pair narrower, ciliolate at the apex; filaments about 1.5 mm long, anthers about 1 mm long, the cells widely separated at the base: pistillate receptacles sessile; outer pair of bracts ovate, 3 mm long, shortly corniculate, glabrous, free for rather more than half their length; next two pairs lanceolate, 2 mm long, corniculate, ciliate; bracteoles narrowly oblanceolate, cuneate, 1 to 1.5 mm long, long-ciliate toward apex; pedicels short; perianth-lobes rounded, about 0.2 mm long; achene brown, becoming rather strongly ridged, about 0.6 mm long.

Succulent or very succulent, 35 to 60 cm high, usually much branched, vegetative parts glabrous, definitely yellowish-green when fresh but losing this somewhat on drying: leaves very shortly petioled or subsessile, the lamina when dry submembranaceous, usually more or less falcate, lanceolate or narrowly elliptic, 3 to 7.5 cm long, 7 to 17 mm wide, or often still smaller, inequilateral, the base of the narrower side acute or subobtuse, of the wider side obtuse or slightly auriculate, the margin of the wider side with usually 7 or 8 teeth, of the narrower usually with one or two less, the apex protracted but hardly exceeding the general outline; triplinerved, other veins usually 4 or 5 on each side, but they and especially the minor reticulations usually little conspicuous; glabrous, but the upper surface with numerous cystoliths; stipules subulate, 2 to 3 mm long.

LUZON, Subprovince of Benguet, Baguio and vicinity, in ravines, *Merrill 7643* (type), *Bur. Sci. 11975, 14004 Robinson;* Mount Tonglon, on banks along trail at 1,600 to 1,800 m, *Phil. Pl. 811 Merrill;* Sablan, *Bur. Sci. 12752 Fénix.* The last specimen was formerly referred by me[a] to *E. viridescens* Elmer, to which *E. lutescens* has great general similarity both in field and herbarium, but on comparison of a very large quantity of material, it differs very constantly in all the characters above noted. Its real alliance is with *E. angustatum* C. B. Rob., which is a more delicate and usually much less branched plant, with thinner (when dry) leaves, the margins with more numerous teeth, and the apex more prolonged.

17a. **Elatostema merrillii** sp. nov.

Admodum parvum, basi reptans, altius ascendens: receptaculis sessilibus, staminiferorum bracteis breviter sed inaequaliter corniculatis; floribus pentameris: foliis parvis, oblique oblanceolatis vel obovatis, triplinerviis vel saepius admodum quadruplinerviis.

Staminate receptacles sessile, few-flowered; outer pair of bracts oval, 2.5 mm long, one of them with a spur extending about 1 mm beyond the general outline, spur of the other shorter and much less conspicuous, both long-ciliate on the margins and back; next two pairs of bracts cuneate-oval, 2 mm long, ciliate; bracteoles oblanceolate, 2 mm long; pedicels short; perianth-segments 5, oval or oblong, 1.5 mm long, slightly corniculate, sometimes ciliate at the apex; filaments about 1.5 mm long; anthers 0.6 mm long, the cells widely separated at the base: pistillate receptacles sessile; outer and inner bracts more or less similar, ovate to lanceolate, shortly corniculate, 2 mm long, ciliate on the margins, more or less villose on the back; bracteoles narrowly oblanceolate, nearly 2 mm long, ciliate; pedicels very short; perianth-lobes 3, rounded, less than 0.1 mm long; achenes light-brown, about 0.5 mm long.

Plants creeping at the base, thereafter ascending, the stems 10 to 30 cm long, densely covered at the apex with rather soft whitish or yellowish somewhat spreading soft pubescence, less densely so below; leaves sessile, the membranaceous lamina obliquely oblanceolate or obovate, 14 to 26 mm long, 6 to 12 mm wide, or some especially toward the base of the plant smaller, the narrower side acute at the base, the wider rounded or slightly auricled, the margin of the wider side not deeply cut into 10 to 12 teeth, the narrower side with about half the number and entire toward the base, the teeth more often ciliate at the apex, apical tooth merely continuing the general outline; upper surface with not very conspicuous cystoliths and usually with scattered but conspicuous fairly long white hairs, under surface with shorter and often yellowish pubescence on the veins and to a less extent between them; triplinerved or with a short additional nerve arising from the costa below the main nerve of the wider side; other veins usually 3 on each side of the costa; stipules hyaline, lanceolate, 2.5 to 3 mm long, ciliolate on the margins and at or near the apex often ciliate.

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[a] This Journal 6 (1911) Bot. 31.

LUZON, Subprovince of Benguet, Mount Tonglon, in very shaded places along trail at about 1,800 m elevation, *Merrill 7647*. The closest Philippine ally of this species is probably *E. acrophilum* C. B. Rob., of which the staminate receptacles are still unknown, *E. merrillii* differing from it by the more pubescent stems, more numerous and shallower leaf-teeth, and venation.

33a. **Elatostema purpureum** sp. nov.

Basi reptans, aliter ascendens, caulibus purpureis, scabris: receptaculis staminiferis sessilibus vel breviter pedunculatis, bracteis vix corniculatis; floribus tetrameris: receptaculis pistilliferis sessilibus: foliis subsessilibus, oblique obovatis vel oblanceolatis, basi latere angustiore acutis, latere latiore breviter auriculatis, marginibus dentatis, apice saepius breviter acuminatis, triplinerviis.

Staminate receptacles sessile or on peduncles up to about 3 mm long; outer pair of bracts 4.5 to 5 mm long, 6.5 to 7 mm wide, rounded and very shortly and inconspicuously corniculate at the apex, densely villose on the back; inner two pairs of bracts 3.5 to 4 mm long, somewhat inequilateral, subquadrate or suborbicular, the margins more or less hyaline, elsewhere villose, ciliate at the apex, hardly corniculate; bracteoles oblong-oblanceolate, 4 mm long, villose on the costa, ciliate at the apex; pedicels up to 3.5 mm long; perianth-segments 4, oblong-lanceolate or lanceolate, 1.5 to 2.5 mm long, ciliate or glabrous, one pair corniculate; filaments about 2 mm long; anthers white, about 1 mm long: pistillate receptacles sessile; outer pair of bracts broadly ovate, 3.5 mm long, villose; inner pairs lanceolate, nearly 3 mm long, ciliate at the apex; pedicels short; perianth-lobes probably 3, about 0.1 mm long; ovary white, 0.5 mm long.

Plants creeping at the base, thereafter curving-ascending, the purple stems 20 to 35 cm long, rarely branched, strigose: leaves almost sessile, the rigidly chartaceous or coriaceous lamina oblanceolate to obovate, 3 to 5 cm long, 1 to 1.8 cm wide, the base of the narrower side acute, of the wider side shortly auriculate, the margins on the wider side with 7 to 14 teeth, on the narrower with 5 to 11, the apical tooth more often extending from 4 to 6 mm beyond the general outline; both surfaces strigose-scabrous, the upper with numerous cystoliths; triplinerved, the nerve of the wider side more often uniting with the lower of the succeeding 3 to 5 veins by minor anastomoses only, veins of the narrower side 2 or 3;

stipules narrowly oblong, 4 to 6 mm long, acuminate, with cystoliths on the costa, ciliate or glabrous.

LUZON, Subprovince of Benguet, Mount Tonglon, in mossy forest at about 1,900 m elevation, *Phil. Pl. 812 Merrill.* With this belongs *Merrill 7644*, from a more shaded place at a slightly lower elevation on the same mountain. The leaves average slightly larger, and are conspicuously thinner, with fewer marginal teeth. Otherwise the two collections agree down to the details of the flowers, and the stipules and venation are the same. *E. purpureum* has as much the general appearance of *E. lagunense* Merr. as of any other Philippine species, but the staminate bracts are less corniculate, the leaves smaller, and the stipules shorter. Probably the closest alliance is with *E. lithoneurum* Stapf.[10]

43. **Elatostema scapigerum** C. B. Rob. in Philip. Journ. Sci. **5** (1911) Bot. 542.

While additional collections have in general confirmed the statements previously made regarding the position of the staminate receptacles of this species, a single small plant of *Vanoverbergh 1236* has the peduncle arising from one of the upper leaf-axils, and on another plant the peduncle is about half-way up the stem. In rare cases, therefore, the species might fail to be recognized by the characters assigned to it in the key, but it is still very different from any other of our species. On the whole, it may best be compared with *E. longipedunculatum* Elmer, but the structure of the staminate receptacles is very different, resembling more that found in the ordinary pistillate receptacles of the genus. By dissecting a young receptacle, also from *Vanoverbergh 1236*, which had attained a diameter of about 8 mm, or about half that of the average mature receptacle, it was easy to trace the 6 bracts typical of the staminate receptacles of the genus, but the two pairs which ordinarily are at least partially covered by the outer pair were at this stage already lateral to the latter. It is probable that still younger stages might show an even more typical structure. These two outer bracts were ovate, 2.5 to 3 mm long, the apex rather acuminate-mucronate than corniculate, for the apical projection is formed by the costa, which bears no spur. The other two pairs of bracts are about 2.5 mm long, also ovate, less acuminate. Still another receptacle of the same collection has a peduncle over 13 cm long. All suspicion that the form might prove to be a monstrosity has been removed, and its range has been extended to Benguet, at Baguio, *Merrill 7882*, and on Mount Tonglon, *Merrill 7637, 7645*.

2. **Elatostema variabile** C. B. Rob. in Philip. Journ. Sci. **5** (1911) Bot. 514; l. c. **6** (1911) Bot. *pl. 1*.

20. **Elatostema banahaense** C. B. Rob. l. c. **5** (1911) Bot. 526.

28. **Elatostema carinoi** W. R. Shaw ex C. B. Rob. l. c. **5** (1911) Bot. 532.

All of these have been supplemented by additional collections, some of which are as typical as could possibly be desired, while others have presented very difficult problems. As regards *E. banahaense*, there are two additional collections from Mount Banajao, *Merrill 7516* and one from the herbarium of the Philippine College of Agriculture, obtained by *S. Asunción*, the former certainly and the latter probably gathered within a very short distance from the exact type locality. Both have more mature staminate receptacles than those of the type, and while the bracts are corniculate, this character is so slightly developed that it is inconspicuous in the mature receptacles, so that the species is better placed near *E. carinoi* than with *E. viridescens* and its allies. Moreover, the leaves have great similarity to those of *E. carinoi*, except that in *E. banahaense* the base of the narrower side of the lamina ends some distance from the petiole, while on the other side it is usually at least subauriculate. But there are intermediates to such an extent that if there were no other character, the species could not be held separate. That character seems to be supplied by the stipules, which are longer and usually wider in *E. banahaense*, their length reaching 25 mm on *Merrill 7516*, and ranging from 14 to 22 mm on the College of Agriculture collection, while they are from 10 mm (young) to 16 mm on the type. The Zamboanga collections cited in the description of *E. banahaense* also show this character, as do two numbers from Mount Pulog, Benguet, *For. Bur. 16047, 16051 Curran, Merritt, & Zsckokke*, originally identified as *E. carinoi* and responsible for part of the variation recorded for that species with regard to this very character, although by some oversight they were not cited. All of these should be referred to *E. banahaense*. The stipules of *E. carinoi* and *E. variabile* are usually narrower, and vary in length from 3.5 to 11 mm, slightly longer on the *E. variabile* type than on the other, but are usually from 4.5 to 7 mm, in contrast to a normal 15 to over 20 mm on *E. banahaense*. Taken in conjunction with the other characters, insufficient as the latter alone would be, *E. banahaense* and *E. carinoi* are better held distinct. This amended view of the affinities of *E. banahaense* also brings it very close to *E. edule*, which has wider leaves, less acuminate, a still more pronounced basal auricle, and stronger venation. It will not be surprising if future collections render *E. edule* untenable as a separate species. As it is, the Mount Mayon plant cited under *E. edule*, is rather *E. banahaense*.

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[10] See above, page 297.

Vanoverbergh 828, the type of *E. variabile*, was pistillate, and on its general appearance, no close alliance with *E. carinoi* would be suspected, but I now find it very difficult to keep them apart, although their union would throw discredit on the validity as differentiating characters of leaf-outline, peduncled as opposed to sessile staminate receptacles, pinnate as contrasted with the most definite triplinerved venation, and coarse teeth or even lobes as against entire margins, all in the one case. No one could fail to distinguish the two types of leaves; one of the difficulties is that some plants having the upper leaves of the narrow, pinnate-veined type of *E. variabile*, have others lower down on the same stems which approach closely to the normal type of *E. carinoi*. This is to some extent shown on *plate 1* of this volume, but is more definite on collections recently obtained. In no case has a plant yet been obtained with leaves which are entirely typical of both species. *Vanoverbergh 1226* is certainly *E. variabile*; the receptacles are borne on slender peduncles usually 10 to 18 mm long, but shorter in the case of very young receptacles; the bracts are barely corniculate as in *E. carinoi*, the flowers tetramerous. The staminate receptacles on the type sheet of *E. carinoi* have usually rather stout peduncles 4 to 6 mm long, hidden on a front view by the receptacles themselves, or the young receptacles may be sessile. *For. Bur. 4841 Curran, Merrill 4847, 7638, Bur. Sci. 2828 Mearns, Bur. Sci. 14111, 14128 Robinson*, are quite typical *E. carinoi* in leaf-characters, except that the under surface of the leaves of the first is slightly pubescent; all but one have staminate receptacles quite as in the type of that species, with short peduncles or none, the exception is pistillate only. *Vanoverbergh 510* is also typical *E. carinoi*, but *Vanoverbergh 510a*, collected by him at a different locality as the same species, while good *E. carinoi* as to leaves, except that they are smaller than usual, has the staminate receptacles on slender peduncles, on one plant 5 to 10 mm long, on the other only 1 to 3 mm. In spite of the differences in the peduncles the plants could so far be separated with ease by leaf-characters. Indeed, by forcing characters which are ordinarily stable, four species could be deliminated. The nature of the material itself shows that such a proceeding would be most inadvisable. The final difficulty comes with *Merrill 7639*, *7640*, collected some days apart from nearly the same locality on Mount Tonglon. Some of the plants are as to leaves typical *E. variabile*, others are equally typical *E. carinoi*, some few have the upper leaves of the former type, but the lower ones approaching those of the latter. Both of these have staminate receptacles. On *7639*, these are sessile except on one plant, where they are very short, while on *7640* they are shortly peduncled or sessile, with no difference in this or any other respect between those in the axils of the two types of leaves. *E. carinoi* and *E. variabile* are therefore very closely allied, having identical receptacles with the same range of variation in their attachment, nor can any sufficient means of separation be found in stipules or pubescence. There remains in doubt the question of leaf-outline, with which the venation is inseparably connected. This is not simply due to difference in habitat. For example, the two forms were found together in the two last collections cited, while my two collections, both perfectly typical *E. carinoi*, came from quite different conditions, one growing in muddy soil along the edge of a ditch among grasses not tall enough to overshadow it, the other was on rock, exposed to the spray of a small waterfall, within a small cavern where it was sheltered from direct sunlight except in the early morning. The link between the species is in the resemblance between lower leaves of *E. variabile* and normal ones of *E. carinoi*; it is not yet quite complete.

Elatostema carinoi is in cultivation at Camp John Hay, near Baguio, growing luxuriantly on rocks in the spray of a small fountain, the only known instance where a species of the genus has been so utilized in the Philippines.

From references to pubescence above and its frequent use in my keys and elsewhere, one without access to the material might suspect that species were being segregated with this as the main character. It is therefore advisable to state that it has been found to be very constant, especially upon the stems, and has been offered as a guide only in the cases where not only this is so, but other characters are present, less easily or at any rate less briefly described. On the leaves, it is not so constant. It does not hold with *E. lagunense*, where in the large clump of plants from which the type and other collections were obtained, it varies from one individual to another in general correlation with the amount of spray received from the Los Baños waterfall, but this is a very exceptional case.

10. BOEHMERIA Jacq.

2a. Boehmeria beyeri sp. nov.

Arbuscula ramosa: dioica, glomerulis axillaribus, sessilibus; floribus staminiferis tetrameris; perianthio pistillifero compresso-oblanceolato, apice contracto, 4-dentato, extus substrigoso, ovarium multo superante: foliis alternis vel rarissime oppositis, valde inaequimagnis sed alternis haud valde reductis, aliis breviter petiolatis, ovatis, aliis mediocriter petiolatis, ellipticis, apice acute acuminatis, margine dentatis, trinerviis vel altero minus conspicuo interjecto.

Dioecious: staminate glomerules axillary, sessile, 5 to 8 mm in diameter; bracteoles elliptic, 2.5 mm long, corniculate, slightly pilose at and near the apex; pedicels about 1 mm long, articulated at the base of the flowers, villose at their apices; perianth-segments 4, oval, subcucullate, 1 mm long, the apical wing projecting about 0.6 mm, canescent-villose except at the base; filaments about 1 mm long; anthers ovate, 0.6 mm long; rudimentary ovary oblong, rounded at the apex, 0.5 mm long, minutely pilose: pistillate glomerules about the same size as the staminate; bracts oblong-lanceolate, 2 mm long, pubescent on the apical two-thirds of the costa and ciliate on the margins; perianth compressed-oblanceolate, 2 mm long, contracted at the apex and obscurely 4-toothed, substrigose on the outer surface; ovary ellipsoid, 1 mm long, pubescent toward the apex; stigma continuous, about 1.5 mm long, not far exserted from the perianth, pubescent along one side.

Shrubs, the branches and branchlets terete, canescent-pilose: leaves alternate or very rarely opposite, alternately unequal in length of petiole, length and usually shape of lamina, the smaller on petioles 2 to 3.5 mm long, the lamina chartaceous or subcoriaceous, ovate, 3 to 3.5 cm long, 18 to 20 mm wide, very shortly and obtusely acuminate, the larger on petioles 8 to more often about 20 mm long, the lamina elliptic to lanceolate, 8 to 10 cm long, 3 to 4 cm wide, the apex contracted into a slender acute acumen 1 to 1.5 cm long, both series of leaves varying from subacute to truncate at the base, slightly inequilateral, the margins dentate except at the extreme base, the teeth shallow, subequal, obliquely ovate, about 35 on each side of the larger leaves, the apices usually blunt, callus-tipped or shortly mucronate; trinerved or with a short and much less conspicuous nerve below the main nerve of one or both sides, the nerves extending about three-fourths the length of the lamina, other veins 3 or 4 on either side or rarely slightly more, the articulations numerous, immersed on the upper surface, projecting on the lower, both surfaces thereby divided into sections about 1 to 1.5 mm wide; upper surface softly or substrigosely pubescent, the hairs substellately arranged in each section, under surface canescent-villose along all the larger veins; stipules lanceolate, scarious, 7 to 11 mm long, long-acuminate, canescent-villose on and near the costa.

LUZON, Subprovince of Ifugao, Bila, *Bur. Sci. 13540 H. O. Beyer:* Subprovince of Benguet, Mount Tonglon, in mossy forest at 1,900 m elevation, *Merrill 7630*. The former contains no staminate flowers, the latter no pistillate; the description, except for the staminate glomerules, has been taken entirely from the type. In the one case where opposite leaves were found, the petioles are about 2 and 3 cm long, respectively, and the lamina of the larger type. In addition to the leaves described, short branchlets often bear smaller leaves, similar otherwise to those of the stem, but with corresponding diminution in the length of the petioles. The species is intermediate in appearance between *B. blumei* Wedd and *B. villosa* C. B. Rob., differing from the former by the absence of reduced leaves on the stems, from the latter by its alternate leaves, more slender petioles, more conspicuous secondary venation, smaller leaf-teeth, and pubescence.

16. PIPTURUS Wedd.

Pipturus dentatus comb. nov.

Pouzolzia dentata C. B. Rob. in Philip. Journ. Sci **6** (1911) Bot. 7.

Material of this species, seen by me in a fresh condition, *Phil. Pl. 807 Merrill*, from near Pauai, Benguet, has led to a complete confirmation of Mr. Elmer's note, cited by me in the original description of this species, as well of my comments thereon. But it has forced the conclusion that the characters depended upon to differentiate *Pipturus* from *Pouzolzia* are not merely unreliable as such, but that many statements regarding them, made by myself as well as by others, are actual errors. Several, including the most important, are here quoted.

Weddell. FEM.: Perigonium .... cum ovario concreto .... Stigma .... caducissimum. Fructus .... siccus.[11]

Weddell. Ovarium perigonio conforme eique adnato .... Stigma .... caducissimum .... Fructus .... e pericarpio nucamentaceo perigonio baccante (?) vestito constitutus .... Fructus s. capitulum fructiferum a peregrinatoribus moriformis dicitur, at specimina exsiccata hunc characterem non retinent.[12]

Miquel. Ovarium perigonio concretum .... stigmate caducissimo .... Fructus .... pericarpio nucamentaceo, perigonio baccato vestitus.[13]

Bentham and Hooker. Fl. ♀: Perianthium .... tenuiter carnulosum. Ovarium inclusum, perianthio adhaerens; stigma .... deciduum. Receptaculum sub fructibus globosum, leviter carnosum v. siccum. And in the key to the genera: Perianthium fructiferum carnosum, ore minuto achaenio incluso subaduato.[14]

Hooker. Fruiting perianth more or less fleshy .... Ovary free; stigma linear, deciduous .... Achene free within the thinly fleshy perianth .... (*P. velutinus*) Fem. perianths succulent, in fruit forming pisiform heads with long exserted recurved styles.[15]

Bentham. Female perianth .... becoming slightly succulent as well as the receptacle when in fruit. Ovary enclosed in and adnate to the perianth, ... style or stigma deciduous after flowering.[16]

Engler. Blh. der ♀ .... bei der Fruchtreife mehr oder weniger fleischig .... N. leicht abfallend .... Frkn. der Blh. abhängend .... Blh. der ♀ bei der Fruchtreife dünn fleischig.[17]

Smith. Perianthium ♀ .... ovarium includens et ei adnatum, persistens .... stigma deciduum. Achenium .... perianthio carnosulo vestitum .... (*P. incanus*) Achenia in excavationes profundas receptaculi carnoso-incrassati succosi irregulariter globosi basi impressi brevissime puberuli immerse .... perianthio arcto inclusa.[18]

Robinson. Stigma deciduous. Fruiting perianth succulent.[19]

The characters which place the genus in the *Boehmerieae* are not quoted, as upon these there is no room for dispute. There remain several points, (1) is the stigma deciduous; (2) is the perianth adnate to the ovary either in flower or in fruit; (3) is the perianth succulent either in flower or in fruit; (4) what is the nature of the receptacle? On all of these points, there is more or less contradiction in the statements cited.

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[11] Ann. Sci. Nat. Bot. IV 1 (1854) 196.

[12] DC. Prodr. **16**¹ (1869) 235.[17]

[13] Fl. Ind. Bat. **1**² (1859) 268.

[14] Gen. Pl. **3** (1880) 390.

[15] Fl. Br. Ind. **5** (1888) 479, 589.

[16] Fl. Austr. **6** (1873) 155.

[17] Die Natürl. Pflanzenfam. **3**¹ (1894) 110, 113.

[18] Koord. & Val. Bijdr. Boomsoort. Java **12** (1910) 724, 727.

[19] This Journal **5** (1910) Bot. 474.

It must be prefaced that the following observations are based upon Philippine material only, and may not hold for species other than those here discussed, but this is improbable. The first significant point is in Weddell's remark upon travellers' field-notes. In gathering fruiting branchlets of *Pipturus arborescens*, the mature receptacles are almost certain to fall unless extreme precautions be taken. It may well happen that even in large herbaria, not a single one of these may be retained. Further, at this stage the achenes are very loosely held in the very fleshy receptacle, in drying they are almost certain to fall apart. Those who have not supplemented their studies by field observation, may have been compelled to draw their conclusions from quite immature fruiting receptacles.

Abundant material of *P. arborescens* was obtained near Manila, from a clump of bushes already represented by *Bur. Sci. 9568*, and showed all stages. The receptacles are developed in acropetal succession along the branchlets, and the flowers are often evident in the axils of the very youngest leaves. At this stage a receptacle can hardly be said to exist, the flowers being almost sessile on the branchlet, the stigmas are quite evident. As the development proceeds, the receptacle becomes more and more evident, at first as a flattened nearly circular plate, with pubescence more conspicuous than itself, but it grows rapidly, becoming roughly spherical, and at this stage ordinarily loses the stigmas, and soon thereafter becomes white, and its ultimate condition is almost exactly that described by Mr. Smith for *P. incanus*. The base may be flat or cuneate, with a more or less angular cross-section, the achenes after the receptacle has become very succulent and waxen-white may be so far immersed that their apex is a millimeter from the outer surface of the receptacle or even more, or they may be still exserted; they are by now practically unattached to the receptacle and may fall separately or the receptacle may fall as a whole. At what stage the term succulent may first be applied to the receptacle, is a matter of choice. At its first appearance, it has the consistence of the herbaceous branchlet to which it is attached; ordinarily, it is distinctly white soon after the stigmas have fallen. When fully mature, there is no room for discussion as to its succulent nature, at least in *P. arborescens* and *P. dentatus*, the two species from which I have seen fresh receptacles. But I take exception to the comparison of their general appearance to those of *Morus*, suggesting *Fragaria* as a substitute.

In other words, the perianth is never more succulent than are the receptacles at their very earliest stages. At first, it is green, ultimately it is brownish-black or black, the apex changing color before the base. There are few plants whose perianth is not equally succulent, *Glumaceae* and such cases excepted, and if there is a difference, the pistillate perianth is further from being succulent in fruit than in flower. Yet, as a descriptive term, I would prefer herbaceous to membranaceous. At all stages, the perianth closely surrounds the ovary or achene, but in no specimen that I have examined in *P. dentatus* or *P. arborescens*, can they be called adnate. The surface of ovary and achene alike is smooth and shining, which in itself nearly answers the question.

Finally, Hooker's apparent inconsistency on the subject of the deciduous stigma may be mentioned, not only again to call attention to the fact that what on a herbarium sheet appear to be mature receptacles may really be earlier stages, but also to emphasize the rather close tendency of some forms to bridge the gap between *Cypholophus* and *Boehmeria* on one hand and *Pipturus* and *Pouzolzia* on the other, with respect to this very character.[20]

Since its segregation by Weddell, no one has proposed to reduce *Pipturus* to any other genus, and certainly I have no such intention. Nor, so far as I can ascertain, has any recent writer wrongly referred to it any species belonging elsewhere, although this discussion has arisen through my own reference to *Pouzolzia* of a species which I now believe to be a *Pipturus*. But upon what character are these genera to be held distinct? Apparently, none can be drawn from the pistillate perianth, and even without going outside of *Pouzolzia*, there are species where that has been alleged to be adnate to the ovary, even as is the case with *Pipturus*, while I have failed to find it so in either genus.[21] There remains the fleshy receptacle, so obvious to every observer in the field, so imperfectly shown in the herbarium, although the early stages even there have evidently been sufficiently indicative. This I believe to be the correct solution.

There has been time to compare notes with Mr. J. J. Smith, who has been able to make a further examination of *Pipturus repandus*. He finds that its fruiting perianth as well as its flowering one is thick and very succulent and replete with a viscid sap. The fruiting perianth is hardly longer than the flowering one, but the color, at first grass-green, changes into a dirty green. His results have led to yet another examination of *P. arborescens*, with full confirmation of the above statements regarding it. The utmost concession that can be made is that the perianth is kept moist by the very succulent receptacle.

The net result of the two series of observations would seem to be that the nature of the perianth is not the same in all species of the genus, but that they agree in the nature of the receptacle. Staminate receptacles are less perfectly developed than the pistillate.

The change in the generic position of *Pipturus dentatus* unexpectedly reveals the fact that it is with difficulty delimited verbally from *P. arborescens*, its nearest ally, as both belong in the group with axillary inflorescence, and have free stipules; and *P. mindanaensis*, the only other species of the genus of which both these statements are true, differs from *P. dentatus* even more than from *P. arborescens*. But the two last differ widely in appearance and are undoubtedly distinct specifically. The petioles of *P. dentatus* are somewhat shorter and stouter, and they like the branchlets are clothed with denser, longer, and less appressed pubescence than those of *P. arborescens*; the leaf-teeth of *P. dentatus* are at once very evident and rounded, in *P. arborescens* they are rarely rounded except when they are very shallow, and their margin on the side toward the apex of the leaf is ordinarily much shorter than toward the base, in *P. dentatus* these margins are more nearly equal. The branchlets of *P. dentatus* are more zigzag than those of *P. arborescens*, and like the upper surface of the leaves dry to a darker color; a conspicuous feature of nearly every shoot of the former is the presence of short axillary branchlets bearing reduced and shorter-petioled leaves, these are much less frequently found on *P. arborescens*, but do occur. The resemblance is still greater to *P. ruber* Heller, of Hawaii, *Heller 2852*, but the stipules of that species are adnate, its petioles are stouter, the lamina larger, less pubescent, usually 5-nerved at the base.

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[20] See This Journal **6** (1911) Bot. 2.

[21] See This Journal **6** (1911) Bot. 8, under *P. rubricaulis*.

18. DEBREGEASIA Gaudich.

Alcoholic material, collected with *Phil. Pl. 808 Merrill*, from Mount Tonglon, Benguet, appears to show that the pistillate perianth when in the flowering stage may be considered very loosely adnate to the ovary. The latter is separated with ease, but usually has attached fragments of tissue from the inner wall of the perianth, which in their turn are readily removable. Still, as the ovary appears roughened, the term adnate may be applicable. But its use as a generic character is to be avoided wherever possible, as there is much reason to believe that the mechanical difficulty of ascertaining the facts has often led botanists working upon dried material to wrong conclusions; if this is not the case, it becomes certain that the ovary and the perianth may or may not be adnate within the limits of the same genus.[22]

Trimen, in his key to the *Urticaceae*,[23] distinguishes *Debregeasia* from *Villebrunea* (*Oreocnide*), by the character "Fem. fls. naked" as contrasted with "Fem. fls. surrounded by fleshy bracteoles." This does not hold true for the Philippine species of *Debregeasia*, as its flowers are surrounded by bracteoles, although these are short, and can hardly be called fleshy.

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[22] See discussion under *Pipturus*, above.

[23] Handb. Fl. Ceylon 4 (1898) 80.

THE PHILIPPINE
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PHILIPPINE MILLETTIAS.

By S. T. DUNN.
(*Kew, England.*)

Being engaged in the study of the large and perplexing genus *Millettia* I requested a loan of the Philippine specimens in the Herbarium of the Bureau of Science in order to supplement the abundant material from those Islands already preserved in the Kew Herbarium. Mr. Merrill's courteous compliance with my request now enables me to draw up the following key to the Philippine representatives of the group, and to add the descriptions of three additional species, the types of which are preserved in the Herbarium of the Bureau of Science.

KEY TO THE PHILIPPINE MILLETTIAS.

1. Flowers subtended by long linear bracts .... 1. *M. racemosa*
1. Bracts short or none.
  2. Leaflets stipellate .... 2. *M. piscatoria*
  2. Leaflets without stipellae.
    3. Flowers paniculate.
      4. Leaflets 3 to 5 .... 3. *M. longipes*
      4. Leaflets 11 to 13 .... 4. *M. litoralis*
    3. Flowers racemose.
      4. Fruiting pedicels 1.5 to 2 cm long .... 5. *M. canariifolia*
      4. Pedicels in flower and fruit less than 1 cm long.
        5. Leaves less than 10 cm long .... 6. *M. foxworthyi*
        5. Leaves 15 to 30 cm long.
          6. Standard without auricles.
            7. Racemes pedunculate .... 7. *M. stipulata*
            7. Racemes floriferous to the base .. 8. *M. luzonensis*
          6. Standard auricled.
            7. Calyx 4 mm deep .... 9. *M. cavitensis*
            7. Calyx 2 mm deep.
              8. Leaflets 9 .... 10. *M. merrillii*
              8. Leaflets 5 .... 11. *M. capillipes*

Millettia litoralis Dunn. sp. nov.

M. dehiscenti Prain speciei javanicae affinis sed tomento inflorescentiae adpresso distincta. Arbor parva (?) ramis fuscis lenticellatis. Folia 5- vel 6-juga, 14 ad 17 cm longa, glabra, petiolo 5-plo longiora; stipulae ovatae persistentes 2 ad 3 mm longae; foliola superiora lateralia ovato-oblonga, obtuse acuminata, basi rotundata, 4 ad 5 cm longa, papyracea, utrinque paullo reticulata, venis 5- vel 6-paribus; petioluli 2 ad 3 mm longi; stipellae nullae. Racemi axillares et, supra folia, stipulis tantum suffulti paniculam formantes, ad 25 cm longi, pedunculati, rachidibus praecipue apice dense adpresse pubescentibus; nodi floriferi brevissimi. Flores fasciculati, 1 cm longi; pedicelli 8 ad 10 mm longi, tenuiter albo-puberuli; bracteae minutae; bracteolae caducae. Calyx late patulus, 2 mm longus, 3 mm latus, infra puberulus, obscure dentatus. Petala alba, minute et sparse puberula; vexilli lamina reflexa, ovata, basi conduplicata nec callosa in unguem angustata, ungue bis longior; alae angustae, semisagittatae; carinae petala basi truncata. Stamina monadelphia. Discus unilateralis brevis. Ovarium lineare, tenuiter puberulum.

MINDANAO, District of Davao, Santa Cruz, *De Vore & Hoover 250*, April, 1903, growing on the sandy beach.

Millettia stipulata Dunn sp. nov.

A speciebus ceteris Philippinensibus stipulis persistentibus reflexis falcatis distincta. Arbor 20 m alta praeter inflorescentiam omnino glabra, cortice rugoso griseo, ligno flavo. Folia bijuga 20 cm longa; stipulae persistentes, oblongae, falcatae, reflexae, 4 mm longae; foliola late ovata, gradatim breviter caudata, basi obtusa vel truncata, ad 10 cm longa, papyracea, subtus glaucescentia, nervis utrinque 6, valde arcuatis; petioli 5 mm longi; stipellae nullae. Racemi axillares 7 cm longi, pedunculis 1- ad 2-plo longiores, rachidi ut pedicellis, caycibus, petalisque laxe sparseque pubescenti. Flores 10 ad 12 mm longi, pedicellis filiformibus 6 ad 8 mm longis. Calyx breviter campanulatus, fere truncatus tandem patulis; bracteolae minutae hirsutae. Petala alba; vexilli lamina ovata, ecallosa, basi plicata, in unguem brevem angustata; alae semisagittatae; carina cuneato-oblonga. Stamina monadelphia. Ovarium lineare, paullo ad apicem tenuiter pubescens, basi disci papillis cinctum.

LUZON, Province of Bulacan, Angat, *For. Bur. 11140 Aguilar*, March, 1908.

Millettia capillipes Dunn sp. nov.

Affinis M. Merrillii Perk. sed foliis bijugis differt. Frutex 5 m altus praeter ovarium omnino glaber, cortice griseo. Folia bijuga, 15 ad 20 cm longa, exstipulata; foliola superiora lateralia lanceolata, apice gradatim acuminata basi acuta, 6 ad 10 cm longa, chartacea, nervis utrinque 5 ad 7 subtus paullo prominulis; petioluli 4 ad 5 mm longi; stipellae nullae. Racemi axillares, 10 ad 12 cm longi, laxiflori. Flores 1- vel

2-ni, 1 cm longi; pedicelli capillacei, 4 ad 6 mm longi, sub flore minute bibracteolati. Calyx breviter campanulata, truncata. Petala rubida. Vexilli lamina rotundo-ovata, basi fortiter bicallosa truncata, in unguem subito angustata. Alae carinaque oblongae basi in unguem angustatae. Stamina monadelphia vexillari basi soluto. Ovarium sessile pubescens.

LUZON, Province of Isabela, Cabagan River, *For. Bur. 18549 Alvarez*, April, 1909, growing on the banks of the stream, flowers pink.

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ALABASTRA PHILIPPINENSIA, III.

By C. B. ROBINSON.

(From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.)

This paper will be devoted in its entirety to miscellaneous descriptions or notes upon various genera or species which have been accumulated at various times. The most noteworthy point is the discovery in the Philippines of the genus *Pimelea,* whose many species are confined to the Australian region, except that herein described and one from Timor.

MORACEAE.

FICUS Linn.

Ficus sericea sp. nov. § *Sycidium.*

Arbor magna: receptaculis sessilibus, axillaribus, magnis, ellipsoideis, extus sericeis: foliis chartaceis, glabris, admodum magnis, elliptico-oblongis vel subovalibus, basi cordatis, subpeltatis, apice breviter acuminatis.

Bracts lunate or nearly plano-convex, very broadly rounded at the apex, 3.5 mm long, 8 mm wide, imbricate, clasping, tomentose: receptacles axillary, sessile, ellipsoid, 3.5 cm long, 2 cm in diameter, densely yellowish-villose-tomentose with hairs up to 4 mm long on the outside, very scaly within: staminate flowers unknown: pistillate perianth-segments 4, linear or linear-lanceolate, 2 mm long, 0.2 mm wide, long-attenuate or more rarely rounded at the apex, costa prominent; ovary sessile, ellipsoid, about 1.3 mm long, gradually attenuate into an undivided style of equal or slightly greater length.

A tree 24 m high, the trunk 70 cm in diameter, the ultimate branches yellowish, annulate, rather densely villose-pubescent: petioles 3 to 4 cm long, 3.5 to 4 mm wide, with more scattered villose pubescence; lamina chartaceous, glabrous, subpeltate, elliptic-oblong or nearly oval, 20 to 28 cm long, 12 to 14 cm wide, the base cordate, the sinus very narrow, 1 cm deep, its sides overlapping on the upper side of the petiole, slightly undulate or entire on the margins, the apex forming a very short obtuse acumen or an acute acumen 15 mm long; two pairs of veins radiating from the costa at or very near the insertion of the petiole, but the upper pair no longer and the lower pair shorter than all except the apical of the succeeding 13 to 16 pairs, these veins uniting to from a definite arched submarginal vein, secondary veins numerous and conspicuous; stipules lanceolate, 3.8 to 4 cm long, 9 to 12 mm wide, acuminate at the apex, truncate at the base, entire or near the apex denticulate, purplish within, tomentose without, sometimes membranaceous-winged.

MINDANAO, District of Davao, Santa Cruz, *Williams 2883*. Very distinct among Philippine species, but closely allied to *F. conspicuabilis* King, from which it differs in the shape of the receptacles, and the more cordate leaves with more numerous veins.

Local name (Bagobo): *maidong*.

URTICACEAE.

ELATOSTEMA Forst. pro parte.

Additional results of the dissection of staminate flowers of this genus are here given. It is unfortunate that so few pentamerous species are represented by sufficient material to justify dissection on a large scale. So far as this has been possible, they have been equally constant. The 39 flowers counted of *E. delicatulum* were all that could be obtained from 24 receptacles, taken from 12 different plants.

Collection number.	Species.	3-merous.	4-merous.	5-merous.
Phil. Pl. 233	*E. spinulosum*		45	
Merrill 6911	*E. heterophyllum*		14	
Bur. Sci. 9480	*E. obtusiusculum*			6
Bur. Sci. 14138	*E. delicatulum*		39	
Bur. Sci. 14139	*E. viridescens*		100	

Elatostema acrophilum C. B. Rob. in Philip. Journ. Sci. 5 (1911) Bot. 523. This has a close ally in *E. obliquifolium* Rechinger,[1] of Samoa, as represented by *Vaupel 209*. The leaves of *E. obliquifolium* are distinctly more reduced on the narrower side than are those of *E. acrophilum*, the upper surface has more conspicuous cystoliths, the veins of the under surface are pubescent, the marginal teeth are less coarse, and the veins are closer, the stem also is more pubescent. In some of these respects, *E. obliquifolium* comes closer to *E. microphyllum* Elmer, but that species has much less oblique leaves.

LAPORTEA Gaudich.

Laportea meyeniana (Walp.) Warb. in Perk. Fragm. Fl. Philip. (1904), 168.

Urtica arborea Luzonis Camel ex Ray Hist. Pl. 3 (1704) App. 70.

Camel's description leaves little doubt that this is the species intended, at least in the main. Its undoubted stinging qualities and its alleged medicinal properties are mentioned. Two of the local names given by him, *lipa* and *lipay* are still in use for *Laportea meyeniana* as well as for other species of the genus; *sagay* is recorded for *L. crassifolia;* the two others known to Camel, *ligathun* and *apareaqua*, seem to have dropped from use. They may not have been Philippine.

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[1] Engl. Bot. Jahrb. 25 (1898) 622; Bot. Zool. Ergeb. Samoa. Salomonina. 3 (1910) 100.

LAURACEAE.

LITSEA Lam.

Litsea glutinosa (Lour.) comb. nov.

Sebifera glutinosa Lour. Fl. Cochinch. (1790) 638.

Litsea chinensis Lam. Encycl. 3 (1791) 574.

Litsaea sebifera Pers. Syn. 2 (1807) 4.

Litsea sebifera was based directly upon Loureiro's species, which has been considered by practically all authors, beginning with Persoon, to be the same as *Litsea chinensis* Lam., although not the species called *L. chinensis* by Blume or Heyne. Another species identified with it has been *Glabraria tersa* Linn. Mant. (1771) 276, upon which *Litsea tersa* Merr. was based. Linnaeus' species is based upon *Lignum laeve minus* Rumph. Herb. Amboin. 3: 72, *pl. 44.* If *Glabraria tersa* Linn. is the same species as *Sebifera glutinosa* Lour., it is its oldest name, if not, it is doubtless the oldest name for some other species yet to be extricated. Both these generic names are older than *Litsea*, but the latter is among the *nomina conservanda*, except so far as *Sebifera* is concerned, it doubtless having been omitted because until recently the portion of the third volume of Lamarck's Encyclopedia in which *Litsea* appeared was thought to have been published in 1789.

In the description of Rumphius' plate, he uses both Latin and local names not mentioned in the preceding text, and it is difficult to say whether he intended them as substitutes or as additional. The plate itself shows *Glabraria tersa* to have the flowers solitary or in fascicles of 2 or 3, leaves with acute bases, acutely acuminate apices, and 3 or 4 veins. Not only the Philippine material identified as *L. chinensis* Lam. or some supposedly equivalent species, but sheets from other countries, have a different inflorescence, although rarely a flower here and there may be solitary. The leaf-veins are more numerous, the leaves themselves broader, usually with a different base and always with a different apex. While there is every reason to believe that *Glabraria tersa* has rightly been referred to *Litsea*, it seems to represent a quite different species from *L. chinensis* Lam.

SAXIFRAGACEAE.

POLYOSMA Blume.

Polyosma retusa sp. nov.

Arbor: inflorescentiis terminalibus, racemoso-paniculatis; floribus viridibus: foliis petiolatis, oblanceolatis, integris, basi acutis, apice retusis, mucronatis.

Inflorescences terminal, about 8 cm long, the flowers arranged racemosely or paniculately, peduncles, when any, about 2 mm long, pedicels about the same length, more or less covered with golden-olive pubescence, which is also present upon the rachis sparingly, upon the peduncles, pedicels, and calyx more densely, on the basal half of the outer surface of the petals very densely and on their apical half more sparingly; bracts at the base of the pedicels and bracteoles (usually 3 in number) at their apices lanceolate to ovate, up to 2 mm long: calyx-tube about 3 mm long; calyx-teeth 4, triangular, 1 mm long; petals 4, valvate, linear-oblong, 7.5 mm long, with a constant width of about 1.5 mm except in the apical 1 mm, where they are rounded to a somewhat hooded apex, their inner surface very densely covered with dirty-grayish pubescence; filaments 4, 3.5 mm long, except at the extreme base dilated and densely covered with grayish-yellow pubescence; anthers narrowly oblong, 2.5 mm long, the apex rounded, the margins of the connective pubescent on the dorsal surface; style 6 mm long, the basal half pubescent, the apical half nearly glabrous and 4-grooved; stigma capitate, 0.75 mm in diameter; ovary 1-celled, with several small ovules on two parietal placentae; fruit ellipsoid or ellipsoid-ovoid, 15 mm long, 7 mm in diameter, apiculate and crowned by the persistent calyx, 1-celled, 1-seeded, glabrous.

A tree 8 m high, the trunk 10 cm in diameter, the dried branchlets black, marked by the scars of fallen leaves, the vegetative parts glabrous except in the youngest stages: leaves opposite or subopposite, the petioles 10 to 13 mm long, the somewhat coriaceous lamina oblanceolate or elliptic oblanceolate, 4.5 to 8 cm long, 2 to 3 cm wide, the base cuneate or acutely acuminate, the margins entire, revolute, the apex retuse and mucronate; lateral veins on each side of the costa 10 to 15.

LUZON, Province of Tayabas (Infanta), Mount Binuang, in mossy forest at 840 m elevation, *Bur. Sci. 9362 Robinson.* Distinguished from all other species of the genus by the retuse leaf-apex, a character which it shares with species of other genera in the same locality.

EUPHORBIACEAE.

CICCA Linn.

Cicca disticha Linn. Mant. (1767) 124.

Averrhoa acida Linn.,[2] a much older name than the above, was based directly upon Fl. Zeyl. 179, with no synonyms cited that were not also in the earlier publication, although some are omitted. The "Flora Zeylanica," in its turn, was based on Hermann's collection of plants and drawings, nearly all from Ceylon. The type of *Averrhoa acida* must accordingly be determined from Hermann. His volumes have been studied with great care by Trimen, and the following notes bear on the present question. "179. Averrhoa acida, Sp. 428 * * * A. Carambola, L., var. ? (*drawing*).[3]" "*P. longifolius*, Jacq. * * * is the 'Nelli' of Herm. Mus. 55, and therefore Fl. Zeyl. n. 179 (and the *Averrhoa acida* of Linnaeus); but there is no specimen in Herb. Herm., and the drawing is by no means characteristic.[4]" The identification of *Averrhoa acida* with *Cicca disticha* is a very old one, going at least as far back as Willdenow,[5] but Mueller did not consider it in his monograph of the *Euphorbiaceae*. The combination *Phyllanthus*

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[2] Sp. Pl. (1753) 428.

[3] Journ. Linn. Soc. Bot. 24 (1887) 142.

[4] Handb. Fl. Ceylon 4 (1898) 26.

[5] Sp. Pl. 4 (1805) 332.

acidus (Linn.) Skeels has recently been based upon it; this is the first time that this has been published, but not the first that it has been used.[6] I am more than ever of the opinion that *Cicca disticha* should not be included in the genus *Phyllanthus*. Did the evidence seem conclusive as to the identity of *Averrhoa acida* with it, no other course would be left open than to form yet a new combination. But however strong the evidence may be that in general the two conceptions were the same, *Averrhoa acida* must be held to be typified by Hermann's drawing, and that would seem to throw the balance in another direction.

There is further difficulty. *Phyllanthus emblica* Linn.[7] has a long-standing acceptance for an important tree, but is also is based directly on the "Flora Zeylanica," and Hermann's drawing is not of the species to which the name is commonly attached, but of *Cicca disticha*.[8]

CLEISTANTHUS Hook. f.

Cleistanthus bridelifolius C. B. Rob. in Philip. Journ. Sci. **3** (1908) Bot. 191.

This finds a close ally in a species of the Malay Peninsula, *Cleistanthus trichocarpa* Ridl. Journ. As. Soc. Straits Branch **59** (1911) 167, represented here by three collections, from Setul, Perlis, and Kedah, *Ridley 14886, 14884, 14884* respectively. The leaves of the Philippine species have different bases, are much more gradually acuminate, and the venation is different, but Ridley's species is probably much its closest ally.

Cleistanthus megacarpus sp. nov.

Arbor: floribus monoicis, staminiferis sessilibus, glomeratis, pentameris, glabris; capsulis admodum carnosis, depresso-globosis, magnis, trilocularibus: foliis petiolatis, chartaceis, ellipticis vel oblanceolate-ellipticis, basi acutis, margine revolutis, apice acuminatis, venis utrinque 9 ad 10.

Staminate flowers sessile in densely bracted clusters; calyx 4 mm long, divided for slightly more than half its length into 5 valvate lanceolate acuminate lobes; petals 5, inserted on the calyx beneath the sinuses of the lobes, about 1 mm long, the lower half conspicuously narrowed, the upper half spreading, 3-lobed, about 1 mm wide near the apex; disk occupying the calyx-tube and with a narrow free margin; androphore attaining 2 mm in length, shorter when younger; filaments 5, about 0.7 mm long; anthers broadly lanceolate, cordate at the base, about the same length as the filaments; rudimentary ovary lanceolate, about 1 mm long: capsules with a somewhat fleshy outer coat, but dehiscent, borne on a pedicel attaining a length of 8 mm, circular in outline, in cross-section triangular with rounded angles and intervening grooves, 2 cm long, 2 cm across the sides of the triangle, 3-celled, with traces of 3 separate styles at the apex; seeds solitary in the cells, lanceolate-ovate in outline, rounded-triangular in cross-section, 13 mm long, 9 mm wide, cordate at the base.

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[6] Bull. U. S. Dept. Agric. Pl. Ind. **148** (1909) 17, Merr. in Publ. Govt. Lab. (Philip.) **6** (1903) 41.

[7] Sp. Pl. (1753) 982.

[8] Trimen in Journ. Linn. Soc. Bot. **24** (1887) 149; Handb. Fl. Ceylon **4** (1898) 20.

Glabrous trees, attaining a height of 10 m and a trunk-diameter of 12 cm, the ultimate branches with striate brownish or grayish-green bark: petioles 10 to 13 mm long; lamina chartaceous, elliptic or oblanceolate-elliptic, 15 to 25 cm long, 7.5 to 8.5 cm wide, acute at the base, the margins slightly recurved and usually slightly undulate, the apex prolonged into an acumen, which is more often slender and sometimes sharply acute, upper surface plumbeous, under surface paler and when young usually glaucous; pairs of lateral veins 9 to 12, all except those near the apex of the lamina nearly straight except close to midrib and margin, not forming a submarginal vein.

MINDORO, Camantigue, Bongabong River, *Whitford 1443* (type); Daihagan River valley, *For. Bur. 3716 Merritt;* south of Lake Naujan, *For. Bur. 6727 Merritt;* Puli River, *For. Bur. 12204 Rosenbluth;* growing in humid forests at low elevations. This approaches among Philippine species the one doubtfully identified as *C. myrianthus* Kurz, but differs in its venation, and all our specimens provisionally named as *C. myrianthus* are too imperfect for their exact position to be ascertained.

Cleistanthus mindanaensis sp. nov.

Arbor Cleistantho isabellino Elmer affinis, sed differt foliis majoribus, crassioribus, minus acuminatis, nervis pluribus.

Flowers borne in axillary clusters surrounded at the base by numerous small ferruginous-pubescent bracts: staminate flowers on short thick pedicels; calyx at first united, at full anthesis 2.5 mm long, divided nearly to the base into 5, coriaceous, ovate, obtuse or subacute lobes; petals 5, 0.7 to 1 mm long, widened upward, denticulate along the upper margin; disk large, fleshy, entire or obscurely lobed; androphore wanting in young flowers, becoming about 2 mm long to the insertion of the filaments; filaments 5 or rarely 6, 1.5 mm long; anthers ovate, up to 1.3 mm long; rudimentary ovary sessile on the top of the androphore, ovate in outline, 0.8 mm long, with 3 rudimentary styles about 0.4 mm long; the flowers and pedicels glabrous: pistillate flowers not seen: fruiting calyx and corolla similar to that of the staminate flowers, the disk thinner; fruit apparently succulent, red, globose, seen up to 13 mm in diameter, lightly 6-ridged, 3-celled, the persistent styles 3, separate, 1.5 mm long, shortly bifid; seeds not developed.

A tree, 12 to 18 m high, the trunk 15 to 18 cm in diameter, the ultimate branches terete or at the apex somewhat angled, the bark gray or brownish-gray, densely and minutely pubescent toward the apex, glabrescent below: petioles stout, 7 to 10 mm long, obscurely annulate, pubescent or glabrous; lamina coriaceous, oblong or elliptic, 8.5 to 15 cm long, 3 to 5.5 cm wide, the base acute, the margins entire, the apex forming an obtuse acumen usually about 8 mm long; upper surface green, shining, under surface paler when glabrescent but when young densely covered with cinnamon-colored pubescence; veins 10 to 13 pairs, evident on both surfaces, projecting on the lower, arching and anastomosing but hardly forming a submarginal vein, finer reticulation also evident.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9474* (type), *9444 Whitford & Hutchinson.* This species was deliberately omitted from my previous summary of the genus on the ground that the unusually soft fruits might entitle it to generic segregation. It differs in no other respect from typical *Cleistanthus*. It is closely allied to *C. isabellinus* Elmer, from Sibuyan, differing in the characters noted above, and in the much stouter branches.

Cleistanthus misamisensis sp. nov.

Arbor praecedenti affinis, sed differt floribus staminiferis minoribus, stylis basi coalitis, foliis chartaceis, ramulis tenuioribus.

Staminate and pistillate flowers borne together in clusters surrounded by numerous very short ferruginous bracts: staminate flowers on very short stout glabrous pedicels; calyx at anthesis 2 mm long, split about two-thirds of the distance to the base into 5 ovate obtuse glabrous lobes; petals 5, obovate, denticulate toward the acuminate apex; disk thin, slightly 10-lobed; androphore thick, seen up to a length of 1 mm to the insertion of the filaments; filaments 5, 1.5 mm long; anthers ovate, 0.8 mm long; rudimentary ovary subglobose continuing without evident contraction into 3 styles, in all 1 mm long: fruiting calyx similar to that of the staminate flowers; petals also subsimilar; fruit probably less succulent than in *C. mindanaensis*, green, seen up to 7 mm in diameter, 3-celled; style usually more or less damaged, but enough remaining to show with certainty that it is united for about 1 mm and then forms 3 arms of shorter length, no trace of bifurcation remaining.

A tree, 4 m high, its trunk 15 cm in diameter, the branches and branchlets slender, bark gray or yellowish-gray, glabrous except around the inflorescences: petioles fairly stout, 3.5 to 7 mm long, annulate, glabrous; lamina chartaceous, elliptic or oblong, 11.5 to 18.5 cm long, 5 to over 7 cm wide, the base obtuse or very slightly emarginate, the margins entire, the apex forming an obtuse acumen 7 or 8 mm long; upper surface somewhat olivaceous-green, shining, under surface paler, minutely pubescent; pairs of veins 9 to 13, evident on both surfaces, projecting on the lower, they and the minor venation much as in *C. mindanaensis*, but the reticulations somewhat laxer.

MINDANAO, Province of Misamis, Iligan, at 50 m elevation, *For. Bur. 15463 Pray & Cenabre. Ahern 577*, from Tetuan, Zamboanga, Mindanao, is almost certainly the same, but is sterile. The species has much similarity to *C. mindanaensis*, but seems distinct by reason of the characters already noted.

Cleistanthus myrianthoides sp. nov.

Arbor: Cleistantho myriantho Kurz habitu proxime accedens, sed differt floribus semper pedicellatis, stylis 2, et notis aliis minus conspicuis.

Flowers monoecious, both kinds on pedicels 1.5 to 5 mm long in the same rather few-flowered glomerules, subtended at the base by short ovate obtuse bracts; the bracts, pedicels, and calyx-tube densely ferruginous-pubescent, the calyx-lobes less densely: calyx of staminate flowers divided nearly to the base into 5 triangular-ovate lobes 2 mm long, often 3-veined; petals 5, oblong-oblanceolate, about 1 mm long, the apex rounded or subtruncate, only obscurely sinuate; disk rather thin, with a free truncate rim, undulate in vertical view; androphore seen up to 1.3 mm long; filaments 5, 0.5 mm long; anthers ovate, cordate, 0.7 mm long; rudimentary ovary elliptic or nearly oblong in outline, showing by difference of color or slight enlargement traces of a stylar portion, the latter most obscurely 4-lobed: calyx of pistillate flowers 2.5 mm long, acuminate; petals oblong; disk nearly covering the ovary, 10-lobed on the margin nearest the styles; ovary ovoid, glabrous, minutely tuberculate, 1 mm long, containing 2 cells each with 2 ovules; styles 2, very shortly united at the base, free for about 1 mm, thence bifurcate for about 0.5 mm, the arms curved or one in each pair straight.

A tree 7 m high, its trunk-diameter 10 cm; the bark of the branches purplish, scaly, marked by lenticels, bark of the branchlets yellowish or reddish, the very youngest parts slightly pubescent, elsewhere glabrous: petioles 7 to 9 mm long; lamina when dried thinly chartaceous, oblong-lanceolate, broadly lanceolate, or nearly elliptic, 7 to 15 cm long, 3 to 6 cm wide, nearly equilateral, the base obtuse, the margins slightly sinuate, the apex contracted, usually very gradually, into an acute or subobtuse acumen, more often about 15 mm long, but with about 10 mm variation on either side, upper surface shining, glabrous, under surface paler, minutely but densely pubescent; pairs of veins 8 to 11, slender, connected by numerous transverse veins, these evident on both surfaces, the finer venation evident on the under only.

LUZON, Province of Camarines, Caramoan, San Roque, *For. Bur. 10679 Curran*, growing at low elevations, used for posts. The specimen has very great similarity in general appearance to *C. myrianthus* Kurz, but the floral characters cited seem to prevent its inclusion in that species. Even very immature flowers are pedicelled, occasional minute ones are not; the number of styles was constant in 10 flowers examined for the purpose, and all of these were in good condition, so that it was possible to be certain that this was not the result of mechanical injury. With this is correlated the difference in the ovary, and perhaps that in the rudimentary ovary.

Local name: *sacatan*.

Cleistanthus pilosus sp. nov.

Arbor, ramulis dense ferrugineo-pilosis: floribus ignotis; capsulis distanter spicatis, bracteatis, 3-locularibus, triangulari-rotundatis, in sinubus dense aliter laxiuscule pilosis: foliis brevissime petiolatis, chartaceis, oblongo-lanceolatis vel oblongis, basi emarginatis, apice obtuse acuminatis, venis utrinque 8 vel 9.

Fruiting calyces sessile on ferruginous-pilose lateral branches 2 to 3 cm long, surrounded by ovate, acuminate, pilose bracts; calyx 4 to 5 mm long, divided for about three-fourths to four-fifths the distance to the base into 5, narrowly lanceolate, densely ferruginous-pilose lobes; petals oval, 1.5 mm long, pilose-ciliate; disk forming 5 semicircular lobes, rounded at the apex, 1.5 mm in diameter, densely pilose; capsule in cross-section triangular, but the 3 lobes broadly rounded, 9 mm long, 12 mm along the sides of the triangle, more or less densely pilose in the sinuses and at the base and apex, elsewhere with scattered hairs or glabrescent; styles united for about 0.5 mm, the rest fallen; seeds not developed.

Presumably a tree, the branches and branchlets slender, the bark purplish, densely pubescent: petioles 1 to 3 mm long; lamina chartaceous, oblong or oblong-lanceolate, 6 to 11 cm long, 22 to 40 mm wide, the base emarginate, the margins entire or very obscurely sinuate, the apex forming a blunt acumen 5 to 12 mm long, upper surface a rather dull bluish-green, glabrous or with scattered hairs on the costa, under surface brownish, densely pubescent on the costa near its base, sparingly pubescent or glabrous on the middle part of the costa and the principal veins; pairs of veins 8 or 9, strongly arched, the secondary veins lax, conspicuous on the under surface, but on the upper no more evident than the finer reticulations, which are hardly visible beneath.

BASILAN, *For. Bur. 19511 Almagro.* Rather distinct amongst Philippine species, approaching closest to *C. vidalii* and *C. everettii*, distinguished from the former by the more evident venation, less acuminate leaves, and pubescence, from the latter by shorter petioles, different venation, more pubescent branches, less pubescent capsules, and the nature of the inflorescence. It is much more widely separated from *C. gracilis*, than is *C. vidalii*.

Cleistanthus vidalii C. B. Rob. in Philip. Journ. Sci. **3** (1908) Bot. 193.

Cleistanthus blancoi Vidal Rev. Pl. Vasc. Filip. (1886) 234, non Rolfe in Journ. Linn. Soc. Bot. **21** (1884) 315.

This approaches rather closely to *C. gracilis* Hook. f., as represented by *Ridley 14900*, from Perlis, Malay Peninsula. The leaves of *C. vidalii* are larger and usually oblong-lanceolate, but some of each species are identical in shape and nearly in size, but in these the base of the Philippine species is more obtuse; the terminal acumen is slightly more prolonged proportionally in *C. gracilis*. In both the venation is inconspicuous, a little more evident in the Philippine plants, where the number of veins is greater.

GLOCHIDION Forst.

The oldest name for this, after 1753 as a separate genus, seems to be *Agyneia* Linn. Linnaeus published[9] two species, considered by Mueller[10] and subsequent authors to be varieties of one, referable to the section *Hemiglochidion*, although Mueller himself cites it as synonymous not with that section but with *Euglochidion*. Nevertheless, the generic name *Agyneia* has been continued in use, not for the species which were so-called by Linnaeus, but for others considered to belong to a different genus. On any possible interpretation of types, the name *Agyneia* would have to be substituted for *Glochidion*, as it is 5 years older, nor is there any bar to such a course in the adopted lists of *nomina conservanda*.

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[9] Mant. (1771) 161. [10] DC. Prodr. 15² (1862) 239, 307.

Glochidion benguetense Elmer Leafl. Philip. Bot. 1 (1908) 304.

This finds a close ally in *G. leiostylum* King. The stylar column is of the same general nature in the two species, but in the Philippine plants is shorter and less deeply cleft, the difference being sufficient to maintain them as distinct. The leaves are also very similar, in outline, apex, and venation; those of *G. benguetense* are usually more inequilateral and obtuse at the base, average smaller in size, and there are fewer of them on a branchlet.

Glochidion cagayanense sp. nov. § *Hemiglochidion*.

Arbuscula: floribus solitariis vel paucis fasciculatis: calyce alte 6-partito, segmentis lanceolatis, obtusis vel subacutis, pistilliferorum longioribus; antheris 3; ovario pubescente, triloculare; stylo basi ovario subaequilato sed duplo longiore, apice leviter incrassato, trilobato: foliis lanceolatis, basi acutis vel rarius obtusis, apice saepius admodum falcatis, acute acuminatis.

Flowers solitary or few in a fascicle, the only staminate one seen near the apex of a branch: staminate flower shortly pedicelled; perianth-segments 6, lanceolate; anthers 3: pistillate pedicels attaining a length of 8 mm, conspicuously thickened at the apex; perianth-segments 6, lanceolate, obtuse or subacute, 2 mm long, pubescent or glabrous; ovary 3-celled, densely pubescent, 0.6 mm long, 0.8 mm in diameter, globose or depressed-globose; stylar column not constricted at the base, there slightly narrower than the ovary, in all about 1.2 mm long, the basal portion cylindric, very slightly widened at the apex and forming 3 thickened obtuse lobes: capsule pubescent or glabrescent, 6 mm long, 1 cm in diameter, 3-celled.

A small tree, 4 m high, its slender ultimate branches covered with grayish bark, the branchlets, petioles, and the bases of the costas of the leaves more or less pubescent: petioles 2 to 3 mm long; lamina chartaceous, lanceolate or broadly lanceolate, 7 to 12.5 cm long, 1.5 to 5 cm wide, acute or obtuse at the usually strongly inequilateral base, the apex usually slightly falcate, forming an acute acumen; pairs of veins 6 to 9, strongly arched, the more basal not uniting with those next above by strong anastomoses, the more apical forming a fairly definite submarginal vein; upper surface plumbeous, under surface brownish; stipules lanceolate, subfalcate, 2.5 to 3 mm long.

LUZON, Province of Cagayan, Claveria, *Bur. Sci. 7390 Ramos* (type); Misiones River, *For. Bur. 16715 Curran*; Mount Ababaca, *For. Bur. 16726 Curran*. The pubescence of the perianth-segments and other parts of the flowers shows considerable variation, but almost its whole range can be found at consecutive nodes of the same branch. In the extreme, the base of the style is also pubescent. Among Philippine species, this is best placed between *G. longistylum* and *G. trichogynum*, being intermediate between these in the lobing of the styles, differing also from the former by its 3-celled ovary, and from the latter by the more horny texture of the walls of the capsules. It is not likely to be mistaken for either on casual inspection, as its leaves are thinner and of different shape from those of *G. longistylum*, smaller, narrower, and more falcate than those of *G. trichogynum*. It resembles *G. brunneum* Hook. f. in its leaves and general appearance of the styles, but the latter has 5 or 6 anthers, a different inflorescence, and the ovary is 4- to 6-celled.

Glochidion curranii C. B. Rob. in Philip. Journ. Sci. 4 (1909) Bot. 102.

This has great general resemblance to a New Guinea species, *Glochidion glabrum* J. J. Smith,[11] but the pistillate flowers are different. The inner lobes of the perianth are very strikingly shorter than the outer, whereas in the Philippine plants, this difference, although noted in the original description, is quite slight. There are other less important differences, but the two species should be considered closely allied, unless more emphasis is laid on this character than has ordinarily been done.

Glochidion ligulatum sp. nov. § *Hemiglochidion*.

Frutex: floribus pistilliferis axillaribus, fasciculatis, vel in ramis axillaribus brevissimis suffultis; perianthio alte 6-partito, segmentis lanceolatis, acutis; ovario triloculare; stylo basi parum ovario altius latiore, multo longiore, apice trilobato, lobis saepe bifidis: foliis chartaceis, anguste ellipticis vel anguste oblanceolatis, utrinque acutis, glabris.

Staminate flowers unknown: pistillate flowers in threes or fours, in axillary fascicles or upon axillary branches about 2 mm long; the bracts sometimes ciliate, the plant otherwise glabrous; pedicels about 0.5 mm long; perianth about 1.8 mm long, divided nearly to the base into 6 lanceolate, barely imbricate, nearly acute segments; petals and disk none; ovary globose, 0.5 mm in diameter, 6-grooved, 3-celled, each cell 2-ovuled, passing with very slight narrowing into a fleshy ligulate or oblanceolate style 2.5 to 3 mm long, 0.8 mm in diameter above the middle, somewhat 3-angled, divided for about 0.5 mm at the apex into 3 lobes, which are nearly always shortly 2-cleft at their apices: capsule not seen beyond 2.5 mm in diameter, still 6-grooved, 3-celled, the cells 2-seeded.

A glabrous shrub, 1 m high, the bark of the branches and branchlets gray, more or less mingled with dark-brown: petioles about 2 mm long; lamina chartaceous, but firm, narrowly elliptic or narrowly oblanceolate, 6.5 to 11 cm long, 1 to 1.7 cm wide, the inequilateral base acute and decurrent, the margins revolute, the apex straight or slightly falcate, barely or not acuminate, acute, mucronate; pairs of veins 8 to 10, slender, their ends forming a widely arching submarginal vein; other venation rather lax, evident; stipules about 1.5 mm long, the base ovate, short, the apex acicular.

LUZON, Province of Ilocos Norte, Mount Dagat, *Bur. Sci. 7746 Ramos*. The section is inferred from its apparent alliances, especially among Philippine species, with *G. longistylum*, which has a longer and narrower style, 4-celled ovary, and more coriaceous leaves. The closest extra-Philippine alliance is probably with **Glochidion podocarpum** (Muell.-Arg.), (*Phyllanthus podocarpus* Muell.-Arg.),[13] of Fiji, which has a 6-celled ovary, a comparatively broader style, and ovate-lanceolate leaves.

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[11] Rés. Expéd. Néerl. Nouv. Guin. 8 (1910) 224, *pl. 53*.

Glochidion philippicum (Cav.) Benth. Fl. Hongkong. (1861) 314 (*G. philippinense*); C. B. Rob. in Philip. Journ. Sci. 4 (1909) Bot. 103.

The range of this species extends from Formosa to Southern New Guinea.[14] *Henry 713* is the basis for the northeastern extension. The flowers are young, at least on our specimen, but taken with the leaves, make the identification reasonably certain. I have also seen some of the collections on which Mr. Smith credited the species to New Guinea, and cannot but agree with him.

Glochidion weberi sp. nov. § *Euglochidion.*

Frutex pubescens: monoicum, floribus fasciculatis, staminiferis pedicellatis, pistilliferis sessilibus sed fructibus pedicellatis; antheris 4 vel 5; columna stylare breve, rotundata, umbilicata, quam ovarium angustiore, basi haud constricta: foliis oblongis, oblongo-lanceolatis, vel oblongo-ovatis, basi obtusis vel truncatis, apice acuminatis, venis utrinque 6 ad 13; stipulis anguste triangulari-lanceolatis, longis.

Flowers of both kinds borne in the same fascicles, the pistillate fewer, earlier developing: staminate pedicels about 3 mm long, rather stout, glabrous on the basal half, pubescent above; sepals 6, the 3 outer broadly lanceolate, fleshy, 2 mm long, obtuse at the apex, pubescent on the outer surface; inner sepals similar in size and outline but still thicker, with a short broad basal claw, thickened at the apex, glabrous or pubescent on the costa only; stylar column in all about 1.5 mm long, the anthers 4 or 5, about one and a half times the length of the produced connective: pistillate flowers sessile at anthesis, but the pedicels in fruiting about 8 mm long; sepals 6 or 7, the inner and outer similar, lanceolate or ovate, 2 to 3 mm long, acuminate or acute, somewhat falcate, with long pubescence on the outer surface; ovary depressed-globose, about 1 mm long and 1.5 mm in diameter, with dense pubescence, concealing the styles, the latter narrower than the ovary, 0.6 mm long, 0.8 mm wide, rounded and umbilicate at the apex, obscurely 5-grooved; fruiting calyx usually closely embracing the base of the capsule or slightly spreading or reflexed; capsules red, obovoid, about 2 cm long and slightly wider, umbilicate at the apex, 10-celled, pubescent; seeds 6 to 7 mm long, 4.5 to 5.5 mm wide, flattened on one side, rounded on the other, the testa smooth, brownish.

A bush, 1 m high, the stem 1 cm in diameter, densely pubescent, bark of the stems gray, of the branches blackish, but both obscured by the pubescence; the hairs alike on vegetative and reproductive parts pale-golden to tawny in color, 1 to 2 mm long, often several-celled: petioles stout, about 2 mm long, densely pubescent; lamina chartaceous, oblong, oblong-lanceolate, or oblong-ovate, variable in size, more often 14.5 to 23 cm long, 4.5 to 8.5 cm wide, but down to 6 to 8 cm long, 3 to 4 cm wide, with intermediates, the base obtuse or truncate, nearly inequilateral but one side often produced slightly beyond the other, the apex acutely acuminate, both surfaces drying brownish but the upper the darker, the upper densely pubescent, the under less so except on the veins; pairs of veins 6 to 13, anastomosing to form a definite arched vein near the margin, cross veins between the principal ones several, finer venation less conspicuous; stipules narrowly triangular-lanceolate or long-acuminate from an ovate base, up to 11 mm long, pubescent-plumose.

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[13] Flora 48 (1865) 370; DC. Prodr. 15^2 (1862) 310.

[14] See J. J. Smith in Koord. & Val. Bijdr. Boomsort. Jav. 12 (1910) 141.

MINDANAO, Subprovince of Agusan, west slope of Mount Hilonghilong, *C. M. Weber 1012*, growing in rocky soil near a stream, at about 400 m elevation.

G. weberi is very different from any Philippine species referable to the section *Euglochidion*, but resembles three belonging to *Hemiglochidion*, *G. trichogynum*, *G. latistylum*, and *G. album*, but apart from the number of anthers, it can be distinguished from all three by the styles, sharply in the case of the first two, less definitely from the last, whose longer and more slender staminate receptacles furnish an additional character for separation, as do the staminate sepals and the stipules. Similarly with the species of other countries represented in this herbarium. On superficial inspection, only two would be thought worth comparing, *G. superbum*, which is in *Hemiglochidion*, and *G. decorum* J. J. Smith, from New Guinea, whose anthers number 4. On a summary of characters, taken in what is considered the order of their relative importance, *G. weberi* seems to find its nearest alliance in *G. multiloculare* Muell.-Arg., but the species are very different in appearance. The most conspicuous characters are pubescence, the size, shape, base, and apex of the leaves; apart from these there are the stipules, pedicels, sepals, and nearly everything except the anthers, styles, and ovary-cells.

Glochidion zeylanicum var. **malayanum** J. J. Smith in Koord. & Val. Bijdr. Boomsort. Jav. 12 (1910) 118.

This species has been credited to the Philippines by Mr. Smith. He writes that he has seen only a single collection from these Islands that he believes referable to this species, but through some unfortunate slip in labeling, the number given by him is one that never existed, *Ahern 1854*. It is possible that it may be *Ahern 185*, which has much the general appearance of *G. zeylanicum* Juss. However, our sheet of that number has staminate flowers, and the anthers number 3 or rarely 4, and I believe that it has been correctly referred to the species called by me *G. album* (Blanco) Boerl., with the qualifications that it may not have been the species intended by Blanco, and is almost certainly not that of Boerlage.[14] It is still more definitely *G. leytense* Elmer. This may not be the collection intended by Mr. Smith, but the number is more nearly similar to that on the sheet at Buitenzorg than is that of any other of our collections of *Glochidion*. It still seems to me that our nearest ally to *G. zeylanicum* is *G. lancifolium* C. B. Rob. This differs from Indian specimens now in this herbarium by the more distinctly peduncled inflorescences, and somewhat in the base and apex of the leaves, but the descriptions of *G. zeylanicum* are nearly wide enough to cover these characters. The leaves of *G. lancifolium* are nearly chartaceous, or sometimes rather thinner or somewhat thicker than would be indicated by that term, but they can not be described as coriaceous, as have been those of *G. zeylanicum*.[16]

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[14] See This Journal 4 (1909) Bot. 99, 100.

OSTODES Blume.

Ostodes ixoroides sp. nov.

Frutex vel arbuscula: inflorescentiis terminalibus vel lateralibus, pedunculis teneris, angulatis, longiusculis; floribus paucis, breviter pedicellatis, dioicis, pentameris: foliis breviter petiolatis, chartaceis, lanceolatis, margine minute dentatis, basi cordatis, apice acuminatis.

Inflorescences terminal or axillary, 4 to 20 cm long, slender, angled, their branches few and short, the dioecious flowers few and forming condensed panicles at the apices of the branches of the inflorescence, with short more or less ciliate bracts: staminate flowers on very short pedicels; calyx about 3 mm long, out about two-thirds of the distance to the base into 5, imbricate, ovate lobes, rounded at their apices; petals 5, free, broadly oblanceolate, 6 mm long, rounded at the apex; disk-glands 5, free, about 0.4 mm long; filaments united to form a column, the outer 5 evident from its base, becoming free at a hight of 1 mm for an additional 0.5 mm, a second whorl at the apex of the column, free for about the same distance as the lower, total length of column to apices of anthers about 3 mm; anthers erect or nearly so, dorsifixed just above their bases, introrse, the cells separate, nearly parallel, the outer halves the longer, about 1 mm long, the connective produced beyond the cells; no rudimentary ovary present; pistillate flowers with a similar calyx, 4 to 6 mm long; petals oval, broadly acuminate at the apex, 7 mm long; disk annular, short, its margin more or less sinuate, ovary subglobose, 2 mm in diameter, glabrous, deeply 6-grooved, 3-celled; styles 3, united at the extreme base, but almost at once forked into 2 arms, in all about 2 mm long, usually nearly horizontal: capsule depressed-globose, 1 cm in diameter, deeply 3-grooved, 3-celled, each cell containing one seed about 6 mm long.

A shrub or small tree, the vegetative parts entirely glabrous, the branches with brownish or grayish striate bark: leaves resembling those of *Ixora chinensis* Lam.; petioles about 3 mm long; lamina chartaceous, lanceolate, 10 to 15 cm long, 2.5 to 5 cm wide, the base cordate, the margins minutely dentate, the apices acuminate; pairs of veins 15 to 20, forming a definite submarginal vein and a fainter outer one.

LUZON, Province of Ilocos Norte, Bangui, *For. Bur. 13426 Klemme* (type, pistillate flowers and capsules); Mount Dagat, *Bur. Sci. 7747 Ramos* (staminate flowers). The arrangement of the stamens suggests *Trigonostemon* rather than *Ostodes*, but the species falls within the limits of the latter.

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[16] Fl. Br. Ind. 5 (1887) 311.

PHYLLANTHUS Linn.

Phyllanthus erythrotrichus sp. nov. § *Paraphyllanthus.*

Suffrutex lignosus, erectus vel suberectus, ramis teretibus, apice trichomatibus rubris longis obsitis: monoicis, floribus sessilibus vel brevissime pedicellatis, solitariis, minutis; staminiferi perianthii segmentis 5 vel 6, disci glandulis liberis, filamentis brevissimis, antheris 3, verticaliter dehiscentibus; pistilliferi perianthii segmentis 6, disco annulare breve, ovario glabro, stylis 3 liberis apice bilobatis: foliis subsessilibus, lanceolatis vel oblongo-lanceolatis, basi obtusis vel cordatulis, inaequilateralibus, apice mucronatis et capillo deciduo instructis.

Flowers monoecious, solitary: staminate flowers with pedicels 0.1 to 0.2 mm long; perianth-segments 5 or 6, lanceolate or oblong-lanceolate, 0.5 to 0.8 mm long, obtuse at the apex; disk glands free, minute except in proportion to the size of the flower; filaments very short but united; anthers 3, 0.2 mm long, free, reaching to the base of the flower, dehisching vertically: pistillate flowers sessile, bracted; perianth-segments 6, oblong to obovate, 1 mm long, obtuse; disk annular; ovary depressed-globose, about 0.5 mm long, glabrous, 3-celled; styles 3, free from the base, up to about 0.5 mm long, at the apex shortly 2-lobed with distinct stigmas: capsule brown, glabrous, 2 mm long, 3 mm in diameter, 3-celled; seeds plano-convex or somewhat gibbous, 1.3 mm long; testa yellowish, with an irregular row of usually elongate comparatively deep pits on the back and often equally developed but more circular pits on the sides.

A woody undershrub, 7 to 25 cm high, the branchlets more crowded near the top, the terete reddish striate stem roughened by scales and the scars of fallen branchlets, the youngest parts and the branchlets shortly pubescent, the larger stems bearing at the apex tufts of reddish hairs 3 to 7 mm long; pairs of leaves on a branchlet 15 to 18: the distichous leaves with comparatively thick petioles about 0.3 mm long, the lamina lanceolate or oblong-lanceolate, 2.5 to 5 mm long, 0.7 to 1.8 mm wide, at the inequilateral base obtuse or slightly cordate, the margins distinctly thickened, simulating lateral veins, the apex mucronate and provided with a hair about 2 mm long, articulated, deciduous and rarely found, the upper surface bearing very short separate hairs resembling glands, the margins ciliolate, the under surface glaucous; venation distinct, often purplish, about 6 lateral veins on each side with a definite submarginal vein; stipules narrowly linear-lanceolate, conspicuous, very acute, 2 to 3 mm long.

LUZON, Province of Cagayan, Mount Cura, at an elevation of 300 m, *For. Bur. 16834 Curran* (type): Subprovince of Bontoc, Linglagan, *For. Bur. 10996 Curran;* Gaddao, *Vanoverbergh 739:* Subprovince of Ifugao, Bila, *Bur. Sci. 13542 H. O. Beyer;* Tukukan, *Bur. Sci. 13541 H. O. Beyer;* Ahin, *Bur. Sci. 13543 H. O. Beyer:* Subprovince of Benguet, Mount Pulog, *For. Bur. 16148 Curran, Merritt, &*

Zschokke: Province of Pampanga, Mount Abu, *Bur. Sci. 1918 Foxworthy:* Province of Rizal, Montalban, *Phil. Pl. 47 Merrill, Bur. Sci. 9542 Robinson.*

In the general alliance of *P. urinaria* Linn. coming closest to *P. benguetensis,* but distinguished from it by the much smaller and differently shaped leaves. The largest-leaved specimens get close to *P. greenei* Elmer, but even in this comparison the branchlets of the latter are thicker, and more definitely angled, and glabrous, and the leaves are of slightly different shape.

Local names (Ifugao): *uguggip, giwi-giwi.*

Phyllanthus macgregorii sp. nov. § *Eriococcus.*

Frutex: floribus pistilliferis longiter pedicellatis, fasciculatis; perianthio 6-partito, segmentis ovatis vel ovalibus, integris; disco subintegro: ovario triloculare, glabro; stylis alte bifidis, reclinatis: foliis lanceolatis vel ellipticis, basi obtusis, apice breviter acuminatis.

Pistillate flowers in axillary fascicles; peduncles slender, dilated at the apex, glabrous, 17 to 32 mm long, arising from crowded, very small, ovate, pubescent bracts: calyx 1.7 to 2 mm long divided for about two-thirds of the distance to the base into 6, entire, glabrous, oval or ovate, acuminate segments; disk nearly flat, thin, on vertical view slightly undulate; ovary depressed-globose, about 1.3 mm in diameter, glabrous, 3-celled; styles 3, forked almost or quite to the base, the arms reclining on the ovary, about 0.7 mm long: capsule seen up to about 5 mm in diameter, similar to the ovary, the seeds not fully developed, their testa smooth.

Probably a shrub, the branches terete, slightly ridged, the branchlets somewhat compressed, pilose along two opposite lines, the older shoots progressively glabrescent; bark dark-reddish, tending to grayish-brown on the older shoots: petioles 1 to 2 mm long; lamina membranaceous or slightly thicker, lanceolate, elliptic, or oblong-lanceolate, 3.5 to 6 cm long, 1.5 to 2.5 cm wide, nearly equilateral, the base obtuse, the apex contracted into an acute or subacute, mucronulate acumen, about 2 to 3 mm long, or merely subacute, upper surface yellowish- or somewhat brownish-green, the under slightly paler, both glabrous; pairs of veins 10 to 15, slender, often little more conspicuous than the intermediates, uniting at their extremities to form an arched submarginal vein: stipules lanceolate-acicular, less than 1 mm long, caducous.

BABUYANES ISLANDS, Dalupiri, *Bur. Sci. 10128 McGregor.* Two or three other species of *Phyllanthus* have been left undescribed, owing to the lack of one or the other kind of flowers, but *P. macgregorii* appears to be so closely allied to *P. stipularis* Merr. that its section may be predicted without the staminate flowers. From that species, it may be distinguished by the much smaller stipules, and the less oblique leaves with much more crowded veins, and of different outline and more uniform color on the two surfaces. In general appearance, *P. macgregorii* has even greater similarity to *P. gracilipes* Muell.-Arg. than to *P. stipularis,* but the calyx-segments of *P. gracilipes* are not entire, nor is the ovary glabrous: it also is in the section *Eriococcus.*

Phyllanthus megalanthus sp. nov. § *Eriococcus.*

Frutex glaber: floribus solitariis, pedicellatis, magnis; staminiferi perianthii segmentis integris 4, antheris 2, transverse dehiscentibus, glandulis liberis, approximatis; pistilliferi perianthii segmentis 6, integris, ovario stipitato, depresso-globoso, 6-sulcato, 3-loculare: foliis suboblongis, inaequilateralibus, basi obtusis, apice acutis; stipulis lineari-lanceolatis.

Flowers solitary, more often near the apices of the branchlets: staminate flowers on pedicels 2 to 3 mm long; calyx-segments 4, 2.5 to 4 mm long, entire, varying in outline from narrowly lanceolate to orbicular-ovate, the inner usually the shorter and wider; disk-glands 4, free but closely approximate, granular; staminal column attaining a length of 2 mm and a diameter of 1 mm, the 4 anther-cells forming a ring at its apex and dehiscing transversely, inclosing a rudimentary ovary 0.3 to 0.5 mm long and 0.8 to 1.2 mm wide: pistillate flowers on pedicels 8 to 10 mm long; calyx-segments 6, entire, the outer oval, about 6 mm long, the inner obovate, about 7 mm long; disk-glands forming a more or less undulate ring, granular; ovary shortly stipitate, depressed-globose, glabrous, 1 mm long, 6-grooved, 3-celled; stylar column entire for about 1.2 mm, then 3-lobed for a slightly longer distance, the lobes bifid for about half their length and recurved: fruiting calyx enlarged, seen up to 13 mm long; stipe 1 mm long; capsule 3 mm long, 4 mm in diameter.

A shrub, 1 m high, glabrous throughout, the branches roughened by the scars of fallen branchlets, covered with reddish bark, the branchlets tending to become crowded at the apex; about 20 pairs of leaves on each branchlet: petioles about 1 mm long; lamina membranaceous, nearly oblong, usually about 20 mm long and 7 mm wide, attaining 24 mm by 10 mm, usually inequilateral throughout its length, the base rounded on both sides or acute on the lower, the apex acute, the under surface much paler than the upper; stipules linear-lanceolate, 2 mm long, acute or sometimes forming an acute acumen for over half their length; venation pinnate, the thin veins about 6 pairs.

LUZON, Province of Cagayan, Mount Alunleng-Bava, *For. Bur. 17243 Curran*, growing on exposed ridges at an elevation of 200 m. Among Philippine species, this comes nearest to *P. stipularis* Merr., from which it is at once distinguished by the size of the calyx. Its closest ally is *P. macrocalyx* Muell.-Arg., of India, which differs in having larger, equilateral leaves, narrower stipules, and smaller staminate flowers with united glands.

TRIGONOSTEMON Blume.

Trigonostemon hirsutus sp. nov. § *Eutrigonostemon.*

Arbuscula hirsuta: inflorescentiis axillaribus; floribus staminiferis in bractearum axillis fasciculatis, pistilliferis solitariis: foliis oblanceolatis, basi acutis, marginibus glandulosis sæpe denticulatis, apice breviter acuminatis, subtus hirsutis; venis utrinque sæpius 22.

Dioecious, so far as known: staminate inflorescences 12 to 17 cm long, axillary, the rachis slender, angled, yellow-hirsute, the bracts or clusters of bracts usually 1 to 2 cm apart; bracts lanceolate, or linear-lanceolate, 5 to 7 mm long, densely hirsute, usually accompanied by two or three similar bracts only 2 to 3 mm long, the flowers 10 or more to each large bract, clustered on very short pedicels, the pedicels after the fall of the flower thickened and hollowed at the apex: calyx imbricate, deeply 4- or 5-parted, the segments unequal, ovate to obovate, 1.5 to 2.5 mm long, sparingly pubescent on the outer surface, the margins entire, not glandular; petals yellowish-green, free, imbricate, 4 or 5, ovate to obovate, 2 to 2.5 mm long; disk at full anthesis shortly cupular, the margins as seen from above undulate; androphore nearly 1 mm long, the anthers 3, in all about 0.7 mm long, the connective parted nearly to the base and projecting shortly beyond the cells, the latter narrowly elliptic, about 0.5 mm long, extrorse, dehiscing longitudinally; rudimentary ovary not present: infrutescence about 8 cm long, otherwise similar to the staminate inflorescence; fruiting pedicels solitary, about 1 cm long, thickened at the apex, hirsute, the basal recurved, the apical spreading; calyx deeply 5-parted, the segments lanceolate to oblanceolate, 3.5 to 4.5 mm long, hirsute: capsule depressed-globose, less conspicuously hirsute, about 8 mm long, over 1 cm in diameter, 3-celled, the cells 1-seeded; seeds about 6 mm long, 6.5 mm wide, the sides nearly flat, the dorsal surface rounded with rather faint longitudinal lines on the crustaceous purplish testa, the cotyledons about 5.5 mm wide, 1.5 mm thick, the radicle about 0.5 mm wide and thick.

Tree-like in habit, but not known beyond 2 m in height, with stems 4 cm in diameter, the apex greenish, somewhat angled, brown-hirsute; leaves simple, alternate; petioles 12 to 35 mm long, hirsute; lamina submembranaceous, oblanceolate, 23 to 33 cm long, 5 to 9 cm wide, the base acute, the margins glandular and often crenulate, the apex abruptly contracted into a subacute acumen 5 to 20 mm long, upper surface sparingly hirsute, under surface rather densely hirsute, both very densely on young leaves; pairs of veins 21 to 24, arched and forming a vein near the margin; stipules lanceolate, hirsute, about 1 cm long.

MINDANAO, District of Zamboanga, Port Banga, *Bur. Sci. 11798 Robinson* (staminate flowers, type), *For Bur. 9311 Whitford & Hutchinson* (fruiting). The two collections are not identical, although certainly very closely allied. Direct comparison is possible only from the leaves, and those of the type are much more denticulate than the other. They are also very similar to the following species, but the staminate perianth makes it impossible to place them together. Neither species is closely allied to *T. philippinensis* Stapf, differing in inflorescence and leaves; both find a near ally in *T. villosus* Hook. f., but have smaller flowers and larger and more numerously veined leaves. None of the flowers on the type are at the most desired stage, but the contrast between the youngest and oldest indicates a development similar to that in *Cleistanthus*. In the youngest there is no trace of an androphore, this being well developed in over-mature flowers on the same plant.

Trigonostemon oblanceolatus sp. nov. § *Eutrigonostemon.*

Arbuscula, praecedenti similis, floribus exceptis minus hirsuta, sed differt floribus staminiferis minus numerosis, calyce hirsuto, connectivo magis producto, petalis purpureis.

Inflorescences about 26 cm long, the rachis angled and grooved, about 2 mm wide, densely hirsute, the flowers racemed, the pistillate solitary, the staminate solitary or very few; bracts lanceolate, 7 to 8 mm long, or shorter at the base and apex of the raceme, densely hirsute, usually accompanied by a pair of much smaller bracts as in *T. hirsutus:* staminate flowers very shortly pedicelled; calyx deeply 5-parted, 2 mm long, or with the dense stiff yellowish pubescence 3 mm long, two of the segments lanceolate, subacute, the other three oblong-obovate, obtuse; petals dark-purple, free, 5, obovate, 3 mm long; disk shortly cupular, free for about 0.4 mm; androphore 1 mm long, the anthers 3, the connective free nearly to the base and strongly thickened and protruding beyond the cells, the latter narrowly oblong, 0.5 mm long, extrorse, dehiscing longitudinally; no rudimentary ovary: pistillate flowers on pedicels 9 to 10 mm long, hirsute, apically thickened; calyx deeply 5-parted, 5 to 7 mm long, the greater extreme including pubescence, three of the segments lanceolate, subacute, the other two membranaceous-margined, oval, obtuse; disk shortly cupular, closely inclosing base of ovary; ovary densely pubescent, 2.5 mm long, 4 mm in diameter, 3-celled, the ovules solitary; syles 3, 0.8 mm long, free from one another, deeply 2-parted.

A tree about 3 m high, its stems 5 cm in diameter, the bark dirty-brownish, the apices greenish, angled, very slightly hirsute: leaves alternate, simple; petioles 10 to 18 mm long; lamina submembranaceous, oblanceolate, 29 to 31 cm long, 9 to 9.5 cm wide, the base acute, the margins merely obscurely sinuate with a very few inconspicuous glands, the apex forming a very short acumen; both surfaces inconspicuously hirsute, except the densely hirsute sides of the costa of the under surface; pairs of veins about 19, arched and forming a submarginal vein.

MINDANAO, District of Zamboanga, Sax River, at 150 m elevation, *Williams 2185.* In the opened flowers, the calyx-segments appear valvate with the exception of the broader ones in the pistillate flowers; in one of these, petals were found loosely adhering to the sides of the ovary, which were quite similar to those of the staminate flowers.

ANACARDIACEAE.

MANGIFERA Linn.

Mangifera verticillata sp. nov.

Arbor magna: inflorescentiis terminalibus, composito-paniculatis, ramis ramulisque tomentosis, valde tetragonis, verticillatis vel subverticillatis; floribus dioicis, pentameris; staminiferorum sepalis liberis, petalis basi ima connatis; stamine uno, staminodiis 4; disco subnullo: foliis verticillatis, longiuscule petiolatis, coriaceis, elliptico-obovatis, basi valde decurrentibus, apice breviter acuminatis; venis utrinque circiter 25.

Staminate inflorescences terminal, 20 to 30 cm long, the rachis, branches and branchlets strongly 4-angled, with grayish-brown tomentum, the branches of the rachis except near its apex verticillate or subverticillate in fours, those of the lowest whorl up to about 12 cm long, those of the second whorl about 8.5 cm long, the secondary branches opposite or subopposite, rarely alternate, variable in length, the lower about 2 cm long, tertiary branches about 1 cm long; all above measurements including flowers; the flowers clustered at the apices of the tertiary branches, the pedicels stout, tomentose, about 0.5 mm long, the bracteoles ovate, obtusely acuminate, 2 mm long, densely pubescent on the outer surface; bracts at the base of the rachis very numerous (judging by their scars), caducous, coriaceous, the base ovate, 3 mm long, contracted into an acute acumen about 4 mm long: sepals 5, free, oblong to ovate, imbricate, obtuse or truncate at the apex, 1.5 to 2 mm long, ciliate; petals 5, imbricate, narrowly oblanceolate, up to 7 mm long, obtuse or barely apiculate at the apex, the margins usually inrolled, glabrous, the costa very conspicuous, otherwise veinless, at the extreme base more or less connate; fertile stamen one, its filament eventually exserted, up to 8 mm long, hardly dilated at the base, usually 4 staminodes of irregular shape 1.5 to 2 mm long at the base of the petals, the bases of the petals, stamen, and staminodes forming a short floral axis around a minute disk: pistillate flowers unknown: fruit said to be similar to that of *Mangifera indica,* but larger, edible.

Said to be a very large tree, with extremely poisonous juice; the ultimate branches rather obscurely tetrangular, with less conspicuous intervening ridges, 12 to 13 mm in diameter at the nodes, very conspicuously marked by the scars of fallen petioles; bark greenish-gray, tomentellose or glabrescent: leaves in whorls of four; petioles 3.5 to 5 cm long, 3.5 to 4 mm wide below the extreme base of the decurrent lamina, strongly dilated at the base; lamina coriaceous, glabrous, narrowly elliptic-obovate to obovate, 12 to 16 cm long, 5.5 to 8 cm wide, the base acuminately long-decurrent, the margins revolute, the apex forming an obtuse acumen about 5 mm long; costa projecting slightly from the upper surface, 3 to 4 mm wide, with slender longitudinal ribs on both surfaces, usually only the latter projecting beneath; pairs of veins 22 to 28, rather straight except toward the apex, the connecting veins obscure but often fairly evident, one or two intervening veins often visible.

MINDANAO, Moro Province, Dapitan, *Father Antonio Obach, S. J.* This remarkable mango, communicated by Father F. Sanchez, of the Ateneo de Manila, seems singularly distinct in its verticillate leaves, but finds its closest alliance in *M. caesia* Jack and *M. superba* Hook. f. Through Father Sanchez' courtesy, I am enabled to quote the following, taken from an account of a trip of his own, near Dapitan, in February, 1892.

"Andando un corto trecho divisamos una segunda colina, en el mismo lado del estero que la anterior y de menor elevación, que llaman Tapucan; en ella nos llamó la atención un árbol de hermosa y ancha copa, llamado *bauno;* que es sumamente venenoso: de él afirma el P. Obach que en cierta ocasión subieron dos muchachos del pueblo á dicho árbol para recoger su fruta, que es comestible, y uno de ellos por haberse hecho un rasguño insignificante en el brazo al trepar por él, quedó tan envenenado al solo contacto de la herida con la corteza, que murió al poco tiempo; el otro llegó á estar de gravedad y al fin con gran trabajo salió con bien del apuro.

Dicen los conocedores del país: que es cosa ya probada, que al cobijarse uno debajo de su sombra al llover ó en tiempo húmedo, le produce hinchazones; y si la cae á uno agua impregnada del jugo de sus hojas causa ampollas ó hinchazones, las cuales dan fiebres y dolores agudos; y por poco que se descuiden en tomar su contraveneno de asta de venado carbonizada, pepita de San Ignacio etc. mueren irremisiblemente. Árbol verdaderamente traidor, ya porque sus frutas son regaladas y comestibles, ya también porque lo sombrío y espeso de su copa convida á descansar debajo de él: pero ¡ay! del que incautamente allí reposa, aún por breve tiempo, pues paga muy cara la sombra y el descanso, ya que no le cueste la vida ó graves dolores." [16]

A drawing of the fruits represents them as nearly oval, and narrowed near the base, about 16 cm long, 10 cm wide; they are said to have a bluish tinge, with white mesocarp, and an oblanceolate seed 9 to 10 cm long.

Local name: *bauno.*

ONCOCARPUS A. Gray.

The collections upon which this genus was based, were made in the Fiji Islands by the Wilkes Exploring Expedition. Pistillate flowers were obtained, but lost, and their description was taken from a sketch, drawn from memory.[17] The genus was retained by Bentham and Hooker, but reduced to synonymy under *Semecarpus* by Engler.[18] Examination of the pistillate flowers of certain Philippine collections, which had been identified provisionally as *Semecarpus*, showed a structure in the ovary and styles very distinct from that of that genus, resembling rather that of *Melanochyla.* It was at first supposed that a new genus was represented, but there is now little reason to doubt that these collections should be placed in *Oncocarpus.* The fact is undeniable that the nature of the styles is not as drawn by the members of the Wilkes Expedition; while it is on this point as evidenced by Philippine collections that the present claim for the validity of Gray's genus is largely based. Fruit of Philippine collections has been compared at the Gray herbarium with the type of *Oncocarpus vitiensis* by Professor M. L. Fernald, who found that there was every external appearance of similarity. It has not been possible to obtain pistillate flowers of the species of Fiji, but I am indebted to Mr. E. G. Baker, of the British Museum of Natural History, for the privilege of examining one of its fruits, collected by Seemann.

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[16] Cartas de los Misioneros de la Compañía de Jesús en Filipinas 10 (1895) 476, 447.

[17] Bot. U. S. Expl. Exped. (1854) 364–366, *pl.* 43.

[18] DC. Monogr. Phan. 4 (1883) 473, 483.

The resemblance is so great that there can hardly be a doubt of the generic identity of the Fijian and Philippine collections, although this involves the assumption that the ovary of the former has been wrongly described.

In the Philippine collections, the style is apical, entire at its base, but soon divides into 3 branches. This is usually evident both in flower and fruit, but sometimes in the latter the ridge overlying the ovule is sufficiently elevated to obscure the short basal portion of the style, and the lobes may seem to be separate styles. The ovary at anthesis already shows traces of invagination in its walls. In fruit, a cross-section shows sometimes a single cell with the lateral, apical, or basal walls more or less invaginated, or other fruits from the same plant may show these invaginations more or less constricted, sometimes reaching the center, sometimes not, so that at some levels they appear to divide the ovary into cells, as many as 14 having been counted. Sometimes these false cells are not developed at the apex leaving a considerable cavity in which the ovule is found. When there are several false cells, the outer surface of the fruit, always forming ridges, has one of these narrower than the others. This narrower ridge corresponds to a similar cavity, in which the ovule can always be found. In some cases this ovule extends to other false cells, but the ovary is always 1-ovuled. I have called these ovules rather than seeds, as they have never been found in our material in developed condition. This may not unlikely be due to the copious resinous secretion, described by the collectors as brown or black, or by one as milk and rapidly becoming a deep-black and strongly staining. No indication has been found that the above-described nature of the ovary is due to insect attack. There are two Philippine species referable to the genus, easily distinguished from one another by the very different size of the leaves, by their shape, pubescence, and somewhat by their venation.

1. **Oncocarpus macrophylla** (Merr.) comb. nov.

Semecarpus macrophylla Merr. in Bull. For. Bur. (Philip) 1 (1903) 33.

MINDANAO, Province of Surigao, Surigao, *Ahern 348, 529.* **The style is simple at its base, often persistent, 3-lobed, and longer than the following species.**

Local name: *pipi.*

2. **Oncocarpus ferruginea** sp. nov.

Semecarpus micrantha? **Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 85, non Perk. Fragm. Fl. Philip. (1904) 27.**

Arbor: foliis petiolatis, oblanceolatis, elliptico-oblanceolatis, oblongo-oblanceolatis, vel ovalibus, basi cuneatis decurrentibusque, apice breviter obtuse acuminatis; venis utrinque 10 ad 15, secundariis valde reticulatis.

Flowers polygamo-dioecious, in terminal or rarely lateral densely ferruginous-tomentose panicles, 10 to 15 cm long, the pedicels at anthesis usually very short, bearing 3 bracts of variable outline from lanceolate to suborbicular and 2 to 3 mm long: calyx of pistillate flowers densely pubescent, 3 mm long, the tube hemispheric, the 5 lobes not exceeding 0.5 mm in length, rounded; petals 5, inserted on the margin of the narrow annular disk, coriaceous, glabrous on the inner surface, hooded, valvate, 2 to 3.5 mm long; stamens 5, always more or less concealed by the dense pubescence of the ovary, the glabrous filaments wider at the base, anther-cells 2, diverging at the base, together ovate, cordate; ovary hemispheric, 2 mm in diameter at the base; style simple for about 0.3 mm, then forming 3 arms about 1 mm long, these having at their apices two very short divergent lobes: fruiting pedicels elongated, the calyx now 6 to 12 mm long, surrounding the swollen hypocarp and usually with grooves corresponding to those of the drupe, calyx-lobes persistent, not enlarged; petals occasionally persistent, little or not elongated; drupe densely ferruginous-pubescent or somewhat glabrescent, obovoid in outline, 15 to 20 mm long, 20 to 25 mm wide at the apex, which is truncate along the margin and depressed in the middle, several ridges extending from base to apex of the drupe, commonly the narrowest of these continued to the persistent base of the style, to which portions of the style-arms sometimes remain attached.

A tree, 10 to 15 m high, its trunk 12 to 22.5 cm in diameter, the more or less angled branchlets covered with gray or blackish striate bark, the younger shoots ferruginous-pubescent or glabrescent with age: leaves alternate, simple, the petioles 1 to 2.5 cm long the lamina subcoriaceous or coriaceous, oblanceolate, elliptic-oblanceolate, oblong-oblanceolate, or oval, 7.5 to 22 cm long, 3.5 to 8.5 cm wide, the base cuneate and decurrent on the petiole, the margins entire or somewhat wavy, the apex abruptly contracted into an acumen 5 to 12 mm long; lateral veins on each side of the midrib 10 to 15, forming a distant submarginal vein, the secondary veins leaving the primary at about a right angle, all these and the finer reticulations conspicuous; both surfaces glabrous, the under when dry somewhat brownish or paler than the shining olivaceous or bluish-green upper surface.

LUZON, Province of Pampanga, Mount Arayat, *For. Bur. 17669 Curran:* Province of Rizal, Bosoboso, *For. Bur. 3173* (type), *2133, 3363 Ahern's collector, Merrill 2654, Bur. Sci. 1507 Ramos;* Antipolo, *Merr. Dec. Phil. For. Fl. 15 Ahern's collector:* Province of Bataan, Mount Mariveles, *Ahern 746, Williams 580, For. Bur. 2388 Borden, For. Bur. 2422 Meyer:* Province of Tayabas, Pagbilao, *For. Bur. 10748 Curran.*

A collection in fruit from Cabadbaran, Butuan Subprovince, Mindanao, is also probably referable to *O. ferruginea.* The fruits are less pubescent, and the calyx is not persistent, the extreme apex of the fruit forms the usual cone within a depression, and shows traces of the styles, usually slightly separated. A section of the fruit shows 9 invaginations, the seed, attached beneath the narrow ridge already described, is better developed than in any of the Luzon material examined, spreading in superficial resemblance to a walnut into each of the cavities. Flowering material will be necessary to a decision whether or not this should be positively referred to *O. ferruginea.*

Local names: *ligayao, ligaas.*

RHAMNACEAE.

RHAMNUS L.

Rhamnus philippinensis sp. nov.

Rhamnus formosana C. B. Rob. in Philip. Journ. Sci. **3** (1908) Bot. **201**, non Matsum. in Bot. Mag. Tokyo **12** (1898) 22.

Frutex, R. formosanae similis, sed differt calyce fructifero truncato, floribus majoribus, foliis crassioribus, latioribus, crenatis, et venis minoribus.

Flowers polygamous, forming axillary or terminal few-flowered leafy cymes, borne on pedicels 1.8 to 3.5 mm long; bracteoles linear, acute, 1.5 mm long: calyx campanulate, 2.2 to 2.8 mm long, divided for over half its length into 5 broadly lanceolate to broadly ovate obtusely acuminate lobes, slightly pilose on the back, the inner surface of the lobes keeled; petals 5, inserted on the rim of the calyx-tube, elliptic, oblong, or oval, about 0.6 mm long, rounded at the apex, narrowed and with short claws at the base; stamens 5 or none, when present inserted with the petals and opposite them, filaments 0.2 mm long, anthers 0.3 to 0.4 mm long; disk lining the tube of the calyx; ovary sessile, subglobose, 0.8 mm long, 1 mm in diameter, 3-celled; styles 2- or 3-cleft, nearly 1 mm long: fruiting calyx truncate at the apex, slightly cupular or flattened, when viewed from below or above very obtusely 5-angled, less than 4 mm in diameter; fruit purple, globose or subglobose, up to 8 mm in diameter, when mature (and dried), strongly 3-grooved with 3 shallower intervening grooves; nutlets usually 2, more rarely 1 or 3, 6.5 to 7.5 mm long, 4.5 mm wide, 1-celled, 1-seeded; seeds about 6.5 mm long, testa brownish.

A shrub 2.5 to 3 m high, the bark of the ultimate branches light-brown to dark-brown, striate, with numerous somewhat conspicuous lenticels, shortly pilose on the branches, branchlets, petioles, veins of the under surface of the leaves, stipules, and branches of the inflorescence: leaves subopposite or well alternate, the petioles 6 to 20 mm long, the lamina rigidly chartaceous, oval or suborbicular, rarely oblong, often of two fairly definite types on the same plant, the one usually 9 to 10 cm long, 5 to 6.5 cm wide, the other 3.5 to 5.5 cm long, 2.5 to 4 cm wide, but some of either type larger or smaller than the figures given, truncate or subcordate at the base, crenate on the margins, somewhat abruptly acuminate and mucronate at the apex; pinnately veined, with 4 to 6 pairs on each side, well arched; stipules linear-lanceolate, acute, caducous, 2.5 mm long.

LUZON, with no further locality, *Loher 331*: **Subprovince of Bontoc, Gaddac,** *Vanoverbergh 732; Bauco, Bur. Sci. 7005 Ramos*: **Subprovince of Benguet, Baguio.** *Elmer 6379, Merrill 7701, Williams 1121* (type), *For. Bur. 4873 Curran*: **Province of Nueva Vizcaya or Pangasinan, Imogen-Nozo trail,** *For. Bur. 15847 Merritt*: **Province of Rizal, Montalban,** *Loher 5822*: **Province of Tayabas, Mount Banajao.** *Whitford s. n.*

With 4 sheets from Formosa for comparison, including two of the type collection, *Henry 1172*, very constantly agreeing with one another, and the above cited Philippine specimens, differing regularly from them in various characters, I feel convinced that two distinct species are concerned. The best character is that of the fruiting calyx, but even by the leaves there is no difficulty in separating the two series. The flowers of the Philippine species are also larger, and those on the Formosan plants are apparently mature. *Rhamnus pulogensis* Merr., the other Philippine species of the genus, is very different.

MALVACEAE.

GOSSYPIUM Linn.

Gossypium paniculatum Blanco Fl. Filip. (1837) 539; ed. 2 (1845) 378.

Blanco's description may be translated thus. Stem round. Leaves alternate, soft, villose, slightly heart-shaped, with 3 sharp lobes, the older leaves with 2 other smaller lobes or also with 3 additional teeth on each side, with 7 nerves, and a small gland on the lower surface of the costa. Petioles long, with 2 awl-shaped stipules at the base. Flowers lateral and inclined to one side, in a kind of simple few-flowered panicle. Pedicel shorter than the flower. Calyx double, the outer of 3 heart-shaped parts, each with a gland at the base and 10 or 11 long sharp teeth. Interior calyx smaller with 5 sharp lobes. Corolla campanulate, red or white, of 5 parts, larger than the outer calyx. Stamens many on a column. Stigmas 3 or 4. Capsule oval, sharp, 4-celled. Seeds enveloped and strongly fastened together by the cotton. Height a little more or less than a vara (836 mm). Known and used in Ilocos, equal in quality to that of Batangas; nevertheless, the latter appears to be the stronger, with more lustre and body, and yet to attain the whiter color. From this cotton the Ilocano women make cloth of exquisite fineness and appearance. It is distinguished from that of Fernambuco (*G. brasiliense* Macfad.) by the inflorescence and other points . . . . Flowers in January. Local name (Ilocano): *capas*.

In order to ascertain the identity of Ilocos cotton, Mr. W. K. Weaver, of Vigan, Ilocos Sur, has obtained four plants from that place for our collections. The first question is whether they represent Blanco's species, and there are difficulties. The bracteoles have 8 to 10 teeth, usually 9, the flowers are not in panicles, the capsules are 3-celled. The last does not entirely contradict Blanco, as he says that the stigmas are 3 or 4. In other respects, the agreement is quite sufficient, the only other discrepancy being with the leaf-glands, which vary on the specimens. All things considered, it is highly probable that these can be identified as *G. paniculatum* Blanco.

Following more modern systems of classification, the alliance proves to be with *G. nanking* Meyen. There is a complete fuzz, the floss is white, the bracteoles are united at the base but only moderately, 2 to 3.5 mm out of a total length of 3 cm; the leaves are definitely or slightly cordate, their lobes are 3 or on older leaves 5, not constricted at their bases, dividing the lamina for half its length, or more often less. Two of the plants were noted as white-flowered, a third as red-flowered, while the upper flowers of the fourth were white and the lower red. But they do not agree well with any of the varieties of *G. nanking* enumerated by Watt,[19] differing from all of them in the bracteoles, probably approaching nearest to var. *rubicunda*. Blanco's species was apparently overlooked by Watt. If the bracteoles be considered insufficiently united for the section of the genus, it would come nearest to *G. punctatum* Sch. & Thon., to which it has much resemblance. On the assumption, apparently warranted, that it is the original cotton used in Ilocos, geography and history aid in its separation from that species, as it is known that cotton was cultivated in that province before the coming of Europeans. This by no means implies that it is native to the Philippines; the presumption is rather that it was introduced from the western Malay Islands at an early date.

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[19] The Wild and Cultivated Cotton Plants of the World (1907) 78, 79, 114–139.

There are many records of the cultivation of cotton in the Philippines, some of these dating back to the coming of the Spaniards, in 1521. Where definite localities are assigned, these are more often Ilocos, but not always. Briefly its history is that the Spaniards found a considerable industry here; that it decayed, at least so far as manufacture was concerned, owing to the importation of dearer and poorer Chinese and Indian materials; that the interruption in commerce at the end of the 18th century, due to the wars with Great Britain, led to its revival; that it has since continued as a minor industry.

The following are a few of the more important references in Blair and Robertson's "The Philippine Islands."

Probably 1586. "Ylocos . . . . is a land abounding in rice and cotton."[20] At this time, cotton was exported from Manila.[21]

About 1620. "The canvas from which the sails are made in the said islands is excellent, and much better than what is shipped from España, because it is made from cotton. They are certain cloths, which are called mantas from the Province of Ylocos, for the natives of that province manufacture nothing else, and pay your Majesty their tribute in them. They are one tercia wide, and as thick as canvas. They are doubled, and quilted with thread of the same cotton. They last much longer than those of España."[22]

1629. (The Igorots) "take away blankets which the people in Ilocos make of excellent quality, from cotton, which is produced in abundance."[23] This applies equally to the present day.

In a very long description of the decay of the trade,[24] the cause assigned is that the money obtained by the Filipinos from the Spaniards left the former in such a state of comparative affluence that they abandoned severer toil, and were content to purchase from the Chinese and others cloth and similar products, which could much better have been made in the Islands and at lower prices. It was even proposed to prohibit such imports entirely.

"The Armenians of India and the Chinese had likewise the control, from the time of the conquest of the islands, of importing into them annually the enormous quantities of small cotton articles (*pañuelos*) and ordinary cambayas which the natives of the country consume, until intercourse with those coasts was interrupted in the late war with Inglaterra. Then necessity and the high price of those goods induced the natives of Filipinas to manufacture them, and in such abundance that the ships which arrived at Manila, after the peace, with those commodities suffered great loss; and from that time the importation of those fabrics ceased, and the natives continued to manufacture them in the country. This has not been the case, however, with the fine cambayas and kerchifs from Madrast, nor with the cotton fabricas from China;" the causes assigned being the superiority of Indian dyes, and the great population and large crops of China, leading to low prices.[25]

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[20] 34: 382.

[21] 7: 35.

[22] 18: 178.

[23] 23: 279, 280.

[24] 8: 78–95.

[25] 51: 253, 254.

Part of Buzeta's note[26] is also given. "Los indios conocían antes de la conquista el algodon, pero ignoraban el uso que podían hacer de sus prodigiosos capullos: dos clases de plantas lo producen; unas son tan crecidas como grandes perales, pero el algodon que dan estos árboles, es basto y solo se emplea para almohadas, colchoncillos, y para fabricar mantas, lonas para velas de buques y alguno que otro tejido ordinario. La otra clase de algodón es la que se cultiva y es mucho más pequeña que la primera. . . . . crece hasta la altura de tres pies."

Under *G. arboreum* Linn., Sir George Watt[27] has cited a plate in the Sloane herbarium, 165: *fig. 212*, as from Camel's collection. This would imply Philippine origin, and a date at the end of the 17th or the beginning of the 18th century. Doctor A. B. Rendle and Mr. Edmund Baker, of the British Museum of Natural History, have examined the plate, and find nothing to justify the opinion that it was in any way connected with Camel. The latter has a brief reference to cotton. "*Gossipium*, seu *Xylum*, Indis *Bulao. Herbaceum & Arboreum*," followed by a short statement of its medicinal properties.[28]

THYMELAEACEAE.

PIMELEA Banks & Solander.

Pimelea philippinensis sp. nov.

Suffrutex: inflorescentiis, superioribus exceptis, longiter pedunculatis, bracteis 4 basin versus coalitis involucratis; floribus circiter 20, breviter pedicellatis; receptaculo anguste tubuloso, supra ovarium post anthesin circumscisso-deciduo; sepalis 4, imbricatis, ovatis, obtusis, parvis; petalis nullis; staminibus 2, filamentis brevissimis, sepalis exterioribus oppositis; ovario uniloculare, uniovulato: foliis oppositis vel alternis, subsessilibus, oblanceolatis vel oblongo-oblanceolatis.

Inflorescences simulating flowers, borne on peduncles of various lengths up to 5 cm, or the uppermost nearly sessile; bracts 4, over 1 cm long, free for about two-thirds of the distance to the base, thence forming a cup containing about 20 flowers, the lobes lanceolate, subacute; the flowers not maturing simultaneously, borne on pedicels about 1 mm long: receptacle white, at anthesis, forming a slender tube 8 mm long and somewhat dilated at the apex, the portion above the ovary falling after anthesis; sepals 4, imbricate, ovate, obtuse, about 0.7 mm long; petals none; stamens 2, the filaments not exceeding 0.5 mm, borne at the base of the outer sepals at the throat of the receptacle; anthers 0.4 mm long, 2-celled; ovary about 1.5 mm long, 1-celled, with one pendulous anatropous ovule; style 5 mm long, the subcapitate stigma opposite the anthers; seeds about 2 mm long, the black testa crustaceous, embryo straight, the fleshy cotyledons about 1 mm long the radicle 0.4 mm long, albumen none.

Probably an annual, suffrutescent, glabrous throughout, 20 to 30 cm high, branched: leaves opposite or alternate, petioles wanting or less than

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[26] Dicc. Islas Filip. 1 (1850) 203, 204.

[27] L. c. 84.

[28] Ray Hist. Pl. 3: (1704) App. 80.

1 mm long, lamina membranaceous, oblanceolate or oblong-oblanceolate, 12 to 26 mm long, 2 to 7.5 mm wide, the base acute or obtuse, the margins entire, the apex blunt; venation obscure, except somewhat the costa.

LUZON, Province of Cagayan, Sanchez Mira, *Bur. Sci. 7410 Ramos.* The genus contains from 70 to 80 species, all from Australia, Tasmania, or New Zealand, with the exception of the Philippine plant and *P. brevituba* Fawc., of Timor, which is its closest ally, the latter having longer sepals and stamens. They are referable to the section *Theoanthes*, but are somewhat intermediate between it and *Calyptrostegia*, having the united involucral bracts of the former, but the receptacle circumscissile as in the latter. The locality of this exile is at the extreme north of Luzon, the elevation was not noted by the collector, but according to his recollection, it grew in light forest or jungle, at less than 100 m elevation.

ELAEAGNACEAE.

ELAEAGNUS Linn.

Elaeagnus philippensis Perr. in Mém. Soc. Linn. Paris 3 (1824) 114.

Elaeagnus perrottetii Schlecht. in DC. Prodr. 14 (1857) 613.

Elaeagnus cumingii Schlecht. l. c.

Elaeagnus alingara Schlecht. l. c. 615.

Elaeagnus angustifolia Blanco Fl. Filip. (1837) 74, non Linn. Sp. Pl. (1753) 121.

Elaeagnus latifolia Auct., quoad Philip., non Linn. l. c.

Realization of the fact, which should never have escaped my attention, that Perrottet had collected plants of this genus in the Philippines, has caused me to reëxamine his description of *E. philippensis*, which I had stated showed his plant to be a *Capparis*.[20] There is room for doubt that my statement was wrong, for while some of the less important characters do point to a *Capparis* common near Manila, all the more essential facts are otherwise. The Philippine species of *Elaeagnus*, exhibits considerable variation, but none of the differences are of sufficient importance to warrant segregation. It ranges from the extreme north of Luzon, to Mindanao, but is represented by comparatively few collections. Perrottet's name, which has been neglected, is much the oldest, and should be used.

MYRTACEAE.

DECASPERMUM Forst.

Decaspermum fructicosum Forst. Char. Gen. (1776) 74.

This, as represented by *Vaupel 291*, from Samoa, has much similarity to both Philippine species. The nearer alliance is with *D. blancoi* Vidal, but the leaves of the latter are distinctly less acuminate. In this respect, the closer resemblance is to *D. paniculatum* Kurz, but the flowers of *D. fruticosum* are larger, and the inflorescence less branched than is usual in *D. paniculatum*.

EUGENIA Linn.

Eugenia balerensis nom. nov.

Eugenia brunnea C. B. Rob. in Philip. Journ. Sci. 4 (1909) Bot. 372, non (Berg) Niedenzu in Engl. & Prantl Nat. Pflanzenfam. 3^7 (1893) 81.

A new name would seem to be required for the above, but the original will again become valid under the Vienna Code if some future monographer should consider the original *E. brunnea* to be untenable.

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[20] This Journal 3 (1908) Bot. 305.

Eugenia brevistylis sp. nov. § *Syzygium.*

Arbor glabra: inflorescentiis terminalibus vel in axillis superioribus, late paniculato-cymosis; floribus parvis, campanulatis; calyce truncato vel subtruncato; petalis saepius liberis; staminibus stylisque brevibus: foliis longiuscule petiolatis, coriaceis, ellipticis, oblongis, vel ovalibus, basi acutis, apice acuminatis, venis confertis.

Inflorescences paniculate-cymose, terminal and sessile or peduncled in the upper leaf-axils, 5 to 12 cm long, 5 to 12 cm wide, the lower branches 4-angled, the lower usually 2 to 2.5 cm long to the first fork, the flowers usually in threes on the ultimate branches and when so sessile or subsessile, when solitary with pedicels 2 to 5 mm long; bracteoles ovate, paired, very short; flowers when very small salver-shaped, at anthesis campanulate; calyx 3 to 4 mm long, the margin truncate or with 4 or even more very short and obscure lobes; petals 4, irregular in shape, ovate, obovate, or oblong in a single flower, 1 to 1.5 mm long, free or somewhat united, rarely extending beyond the outline of the calyx; disk comparatively thick but nowhere free from the calyx; stamens about 20, the filaments stout, 0.8 mm long or less, the anthers about 0.3 mm long; styles rarely exserted, less than 1 mm long; ovary 2-celled.

Trees about 15 m high, the trunks 30 to 45 cm in diameter, the bark of the branchlets light-gray; branchlets and branches terete: petioles 10 to 14 cm long; lamina coriaceous, elliptic, oval, or oblong, 5 to 7.5 cm long: 24 to 42 mm wide, the base acutely acuminate and decurrent, the apex contracted into an obtuse acumen 5 to 15 mm long; veins crowded with little distinction between primary and secondary and inter-reticulating, the former from 25 to 40 in number, terminating in a definite if slender vein less than 1 mm from the margin in narrower leaves, nearly 2 mm from the margin in the widest, the upper surface shining, the under duller.

MINDANAO, District of Zamboanga, Subanginagayas, *For. Bur. 12459 Tarrosa* (type). To this also almost certainly belong two other collections from the same district, *For. Bur. 9192, Whitford & Hutchinson*, from Port Banga, and *For. Bur. 15228 Klemme*, from Limaong, but there are curious differences. *For. Bur. 9192* has the calyx divided midway in its length, and the upper and lower halves are each swollen into a number (usually 8) of nearly globose lobes. The same condition is also found on some of the flowers of *For. Bur. 15228*, but in addition there are quite typical *Syzygium* fruits, nearly globose, 6 to 8 mm in diameter, the calyx-rim almost truncate but on very careful examination showing very short lobes, not at all swollen. It seems, therefore, that the lobed fruits above described are merely pathologic states, as there is no other reason why these collections should not be identified with *E. brevistylis.* The type has another unsatisfactory feature from the point of view of the describer. Small-sized flowers have often already lost their petals and stamens, much larger ones still possess them; the diagnosis was drawn from the latter. The closest alliance of *E. brevistylis* seems to be *Syzygium campanellum* Miq., supposedly of Java, but the stems are terete and of different color, and the petioles are longer. The closest Philippine alliance is with *E. perpallida* Merr., which has smaller and more acuminate leaves, the inflorescence usually shorter, and the anthers more numerous. An almost equally natural and even greater superficial resemblance is to *E. grisea* C. B. Rob., so much so that three collections previously referred to the latter should be included in *E. brevistylis*. These are *Ahern 429*, Tinago Island; *Ahern 443*, Dinagat; and *Ahern 516*, Surigao. The species appear sufficiently distinct in the less crowded flowers, fewer and shorter stamens, and shorter styles of *E. brevistylis;* its petioles are often longer and more slender, but there is little vegetative difference.

Local names: *canomay* (Tinago); *lagi-lagi* (Dinagat, Surigao); *malaruhat* (Zamboanga).

Eugenia calleryana sp. nov. § *Syzygium.*

Arbor glabra: inflorescentiis terminalibus, saepius sessilibus, corymboso-paniculatis; floribus albis, sessilibus vel subsessilibus; alabastris turbinatis; calyce truncato, corolla calyptrata sed petalis 4 separabilibus composita: foliis chartaceis, ellipticis vel anguste ellipticis, mediocribus, basi acutis decurrentibusque, apice acuminatis; venis utrinque 11 ad 15.

Inflorescences terminal, sessile or by abortion of their lowest branches or of the uppermost leaves peduncled (the terminal stem-internode usually about 4 cm long), corymbose-paniculate, 2.5 to 6 cm long, 3.5 to 9 cm wide, trifurcate at the base and at usually 2 or rarely 3 succeeding nodes, the basal lateral branches usually about 15 mm long to the next fork, the second pair of lateral branches about 8 mm long, the basal internode of the central branch 1 cm long, or all these proportionally longer in the largest panicles; the branches forked like the panicle itself, the basal secondary branches 7 to 10 mm long, these and the upper branches again trifurcate, the lower basal tertiary branches about 2 to 5 mm long, 1-flowered, the central tertiary branch of similar length, 3-flowered, the flowers sessile or subsessile; bracteoles present but minute: buds just before anthesis turbinate, about 7.5 mm long, including a pseudostalk about 2.5 mm long, 4.5 mm wide below the apex, 4 mm wide at the apex of the calyx; calyx margin truncate or most obscurely with 4 very short and very broadly rounded lobes; corolla calyptrate but easily separable into 4 petals of irregular size and shape, from 2 mm long and 4 mm wide to 1.8 mm long and 2.5 mm wide in the same flower; disk not thick; stamens numerous, about 80, in fully matured flowers averaging about 15 mm in length, anthers about 0.5 mm long; style up to 15 mm long; ovary 2-celled, thick-walled, with rather numerous ovules.

Trees, 8 to 10 m high, the trunk 12 cm in diameter, the bark of the branchlets gray-cinnamon, terete, the ultimate branchlets often compressed: petioles 7 to 10 mm long; lamina thinly chartaceous, elliptic or narrowly elliptic, 12 to 19 cm long, 3.5 to 7 cm wide, the base acute and decurrent, the apex forming an obtuse acumen usually 6 to 10 mm long, upper surface green, shining, under surface paler-green; pairs of lateral veins 11 to 15, with very definite lateral veins usually formed by the third basal pair about 4 mm within the margin, fainter lateral veins formed by the second basal vein for nearly the length of the lamina and by the basal vein for a shorter distance, cross-veins and finer venation also well evident on both surfaces.

LUZON, Subprovince of Benguet, Sablan, *Bur. Sci. 13544 Fénix*, in flower, Nov. 28, 1910. This has its nearest Philippine ally in *E. brittoniana* C. B. Rob., from which it is distinguished by its larger and thinner leaves, of different shape and venation. Among outside species, the nearest alliance seems to be with *E. valetoniana* King, which has coriaceous leaves of different color, with more numerous nerves. The species is named for the supposed first botanical collector in the mountainous parts of northern Luzon.

Eugenia clementis C. B. Rob. in Philip. Journ. Sci. 4 (1909) Bot. 383.

Comparison of the material upon which this species was based, now supplemented by *For. Bur. 16456 Pray*, also from Lake Lanao, Mindanao, with *Eugenia lanceolata* Lam., as represented by *C. P. 2863*, from Ceylon, shows that the two species are very closely allied. The leaves of the type of *E. clementis*, *Mrs. Clemens 1036*, have the veins much more crowded and more evident than the Ceylon plant, but on *Mrs. Clemens 1113*, which in spite of other differences I am disposed to consider specifically the same, the veins are less numerous and more widely separated, rather closely approaching those of the latter. In this respect, Pray's collection agrees with *Mrs. Clemens 1036*. *Eugenia lanceolata* Lam. is considered to be the same as *E. wightiana* Wight, but the venation of the latter, as shown by Wight's plate,[30] is much more open than that of typical *E. clementis*. Moreover, it shows no submarginal vein, although this is present on *C. P. 2863* in practically exact agreement with *Mrs. Clemens 1113*, whereas in *Mrs. Clemens 1036* and *For. Bur. 16456*, the vein is almost at the extreme margin. Reëxamination of the flowers of the type of *E. clementis* shows that the petals are often more than 4, although I have not succeeded in finding more than 6. Ordinarily, the outermost is the largest, forming a calyptra, and the others are more or less united with one another but separate from the outer, the result being that it is rather difficult to determine just how many petals are represented.

Eugenia corymbifera Koord. & Val. in Meded. Lands Plant. 40 (1900) 99.

LUZON, Province of Nueva Vizcaya, *For. Bur. 10882 Curran*: Province of Zambales, Mount Pinatubo, *Loher 6040*: Province of Bataan, Limay, *For. Bur. 19149 Curran*; Duale, *For. Bur. 20055 Topacio*.

From Koorders and Valeton's description, taken in conjunction with two sheets form the Botanical Gardens at Buitenzorg, *V, C, 59* and *V, B, 25*, the above identification seems quite positive. The second and third of the above collections are between flower and fruit, and have distinctly stouter inflorescence-branches than the Javan, but the remaining Bataan plant is in early bud, they are then more slender than in the latter. In general, the leaves of the Philippine plants are slightly different in shape, rather elliptic or elliptic-lanceolate than oblong-lanceolate, but so are some on the Javan specimens. The venation is the same, but more conspicuous on the Philippine leaves; morever their petioles are rather stouter. However, these are quite insufficient characters upon which to separate the series of the two regions. Of the six collections above cited, *V, B, 25*, is at least superficially, the most distinct.

[30] Ic. Pl.: *pl. 529.*

Eugenia lacustris C. B. Rob. in Philip. Journ. Sci. 4 (1909) Bot, 377.

This is not the oldest use of this name, as in Chodat and Hassler's *Plantae Hasslerianae,*[31] it is applied to two different species. While it would not have been given to the Philippine plant, had the facts been known in time, there seems no sufficient reason for displacing it, as in both of the Paraguayan cases, it can not be considered more than a *nomen subnudum*. Both have localities and collection numbers assigned, beyond this the first has only "Frutex 4–6 m. petala persicina," and the second "Frutex 2–3 m. petala alba." In the *Plantae Hasslerianae*, some ten species of *Eugenia* are indicated as new under names previously employed.

Eugenia lutea sp. nov. § *Jambosa.*

Arbor, Eugeniae jambos Linn. affinis: inflorescentiis corymboso-paniculatis, divaricatis; floribus luteis, tetrameris, longe pedicellatis, calycis lobis conspicuis, persistentibus, petalis liberis, disco bene evoluto: foliis petiolatis, coriaceis, elliptico-lanceolatis vel oblongo-lanceolatis basi acutis decurrentibusque, venis utrinque 5 ad 9.

Inflorescence terminal, corymbose-paniculate, 12 to 15 cm long, 11 to 12 cm wide at the apex, trichotomous or some of the branches aborting, 9- to 12-flowered, the peduncle 2.5 to 3.5 cm long, the ultimate pedicels 16 to 30 mm long, 1-flowered; buds just before anthesis yellow, turbinate, 2 cm long, 1.5 cm long to the base of the calyx-lobes and there 1.2 cm wide; calyx-lobes 4, overlapping at the base, the outer pair 4 to 4.5 mm long, 10 mm wide, the inner pair 7.5 mm long, 15 mm wide, all broadly rounded at the apex; petals 4, free, 10 to 15 mm long, 15 to 16 mm wide; disk well developed, circular in outline; filaments numerous; style (in fruit) up to at least 4 cm long: fruit urceolate, excluding the calyx-lobes, these persistent, suberect or spreading, incurved, coriaceous, their bases about 1 cm above the insertion of the styles.

A tree, about 20 m high, with a trunk 40 cm in diameter, the ultimate branches terete, with pale-cinnamon or yellowish bark; petioles 1 to 2 cm long, lamina coriaceous, elliptic-lanceolate or oblong-lanceolate, 13 to 20 cm long, 3 to 8 cm wide, the bases acute and decurrent, the apices probably shortly acuminate, both surfaces brownish or olivaceous, but the upper more shining; primary lateral veins on each side of the midrib 5 to 9, projecting moderately from the lower surface, nearly level with the upper, the midrib impressed on the upper and distinctly projecting from the lower surface, the veins in the basal half or two-thirds not uniting except by minor anastomoses and therefore not forming a definite submarginal vein.

LUZON, Province of Tayabas, Quinatacutan, on rocky river-banks at 100 m elevation, *Bur. Sci. 13201 Foxworthy & Ramos* (type); Guinayangan, *For. Bur. 18635 Darling*.

Eugenia lutea seems to find its nearest ally among species of extra-Philippine distribution in *E. jambos* Linn., but more nearly approaches others supposed to

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[31] Bull. Herb. Boiss. II 7 (1907) 806, 807.

be endemic in these Islands. It may be distinguished from *E. squamifera* by its longer petioles, more acute leaf-bases, wider-branching inflorescence, and the color of the flowers; from *E. xanthophylla* by the longer petioles, more coriaceous and usually larger leaves, wider-branching inflorescence, and the color of the flowers; from *E. sulcistyla* by the wider and different inflorescence, differently shaped buds, and the somewhat longer petioles. The wood is utilized commercially.

Local names: *macaasin, malayambo.*

LEPTOSPERMUM J. R. & G. Forst.[82]

When originally published, this genus contained 7 species, *L. scandens*, *L. collinum*, *L. ciliatum*, *L. perforatum*, *L. leucadendron*, *L. scoparium*, and *L. virgatum*, the first five forming a section *Callistemones*, the remaining two a section unnamed. The first four are to-day placed in the genus *Metrosideros* Banks ex Gaertn.[83] The fifth species was based on *Melaleuca leucadendra* Linn., although as the Kew Index states it to be equivalent to *L. flavescens* and *L. pubescens*, there may have been a mixture of herbarium material, of which a wrong identification had been made. Only the sixth is now considered to be a *Leptospermum*, the seventh being a *Baeckea*.

What the Forsters intended in founding this genus is open to conjecture, as they presumably considered all of their seven species to be congeneric, and yet they included amongst them *Melaleuca leucadendra* Linn., the only species placed by Linnaeus in *Melaleuca*,[84] no other having been published therein during the intervening nine years. Apparently, *Leptospermum* was brought forward as a substitute name for *Melaleuca*, and color is given to this view by the fact that the younger Forster subsequently transferred all seven species to the latter. If this view be rejected, the type of *Leptospermum* would seem to be *L. scandens*, which is both the first species described and the first figured; *L. scoparium*, which alone belongs to the genus as at present interpreted, being the sixth described and the second figured. On this view, *Leptospermum* would become a synonym of, or rather an older name for *Metrosideros*. The Brussels Congress is believed here to have ruled in favor of the latter over *Nani* Adans.,[85] a still older name, but there is still no international legislation to cover such cases as that of *Leptospermum*, or even the still worse ones, where additions and subtractions have left a genus without any of the species ascribed to it by its original author.

MELASTOMATACEAE.

MEDINILLA Gaudich.

Medinilla disparifolia sp. nov.

Scandens, ramis teretibus, ultimis hirsutis: inflorescentiis brevibus in foliorum infimorum axillis vel in ramis; floribus admodum congestis, tetrameris: foliis oppositis, dimorphis, petiolatis, elliptico-obovatis, magnisque, vel sessilibus, late ovatis, parvisque, 11- vel 13-plinerviis.

Inflorescences about 3 cm long, in the axils of the lowest leaves or beneath them, the peduncle about 1 cm long at the base with dense brown pubescence about 4 mm long, above with much shorter and scattered pubescence; flowers somewhat crowded, short-bracted, the pedicels about 4.5 mm long: flowers wanting: fruit baccate, lilac to purple and blue, the calyx urceolate, in all 1 cm long, glabrous or slightly scurfy on the free portion, the ovarian part subglobose about 8 mm wide, contracted at the apex to 6 mm, the rim free for about 2.5 mm, with 4 minute teeth; ovary 4-celled, attached to the calyx along 4 lines, the ovules very numerous, minute.

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[82] Char. Gen. Pl. (1776) 47, 48, *pl. 36.*

[83] Fruct. 1 (1788) 170, *pl. 34.*

[84] Mant. (1767) 14.

[85] Fam. Pl. 2 (1763) 88 581.

Climbing and rooting at many of the nodes, the stems terete, with gray bark, glabrescent; the ultimate branches hirsute: leaves opposite, those of a pair very different, the one kind on stout hirsute petioles 16 to 24 mm long, the subchartaceous lamina somewhat falcate, elliptic or elliptic-obovate, 18 to 23 cm long, 7 to 11 cm wide, the other kind ovate, sessile and clasping, about 3 cm long, 2 cm wide, both kinds obtuse at the base and shortly acuminate at the apex, the smaller 11- or 13-nerved, the nerves separate to the base, the larger with equally numerous veins but the uppermost pair leaving the costa about 7 to 8.5 cm from the base, the next pair 4.5 to 5 cm, the next 1.5 to 2 cm, the next about 5 mm, the remaining one or two pairs fainter, subbasal, all united with the midrib or the succeeding by fairly numerous nervules; upper surface plumbeous, glabrous, under surface greenish, the nerves and veins yellow-hirsute, especially toward the base of the costa.

LUZON, Province of Laguna, Mount Banajao, along a small stream at the base of the mountain, *Bur. Sci. 9764 Robinson*. While reduced leaves are known in other species, especially in *M. inaequifolia* C. B. Rob. and to a less extent in *M. involucrata* Merr., they are here still more striking, resembling the spathes of aroids; the present species differs from both these others in the nature of its inflorescence. In the latter respect, it probably approaches *M. cephalophora* Merr. more closely than any other, but the peduncle is different, and the leaves have quite different venation.

MELASTOMA (Burm.) Linn.

Melastoma warrineri sp. nov.

Frutex: inflorescentiis unifloris ad trifloris; floribus conspicue bibracteatis, bracteis calyceque sericeo-paleaceis; calycis tubo quam lobi longiores breviore, lobis intermediis inconspicuis: foliis chartaceis, ellipticis vel fere ovalibus, basi acutis, apice acute acuminatis.

Inflorescence a terminal, sessile, 1- to 3-flowered cyme, the pedicels 3 to 5 mm long, bearing at their bases two rigid appressed broadly elliptic-lanceolate bracts, deciduous after anthesis, 18 to 30 mm long, 7 to 11 mm wide, acuminately narrowed to a truncate base, acutely acuminate at the apex, their outer surface and the pedicels densely covered with appressed linear paleae about 1 mm long, coarsest in the middle of the bracts, their margins ciliate-serrate, the apex ciliate-acuminate, the margins of the bracts pilose-ciliate, their inner surfaces appressed-pilose:

calyx-tube 9 to 12 mm long, 8 to 9 mm in diameter, its lobes 10, the longer series triangular-lanceolate, straight or falcate, 19 to 20 mm long, 5 mm wide, acuminate, covered with paleae 1.5 to 3 mm long, longest and broadest near the middle of the tube, decreasing in density and breadth toward the apex of the lobes, bearing long cilia on their margins, these appressed except on the margins of the lobes; the intermediate 5 lobes 3 mm long, or including the acumen and paleae 5 mm long; petals 5, lilac, broadly oblanceolate or obovate, often oblique, 3.5 to 4 cm long, the apex truncate and toward its middle sometimes slightly retuse, always shortly acuminate, the acumen and the extreme base with tufted cilia, the margins ciliate; stamens 10, 5 fertile and 5 probably sterile but having anthers of approximately equal size, the fertile anthers lilac, connective pale-lilac, the spurs, filaments, and sterile anthers greenish; fertile anthers with filaments 13 to 14 mm long, the connective of similar length from the base of the anther to the filament, prolonged beyond the filament for 3 mm, the prolongation forked midway into 2 spathulate obscurely 2-forked lobes, fertile anthers 1 cm long; sterile anthers 8 mm long, the connective merely forming anteriorly 2 falcate-ovate horns immediately below the anthers, their filaments 1 cm long; ovary more than half-superior, 1 cm long, covered with sericeous paleae densely tufted at the strongly beaked apex, 5 celled, with very many small ovules; style exceeding 2 cm in length, dilated toward the apex, the stigma plane.

A bush about 2 m high, the branchlets terete, densely covered with ferruginous paleae, the nodes with a single whorl of setae: petioles 13 to 25 mm long, lamina chartaceous, elliptic, elliptic-lanceolate, or almost oval, 9.5 to 16 cm long, 3.5 to 6 cm wide, usually conspicuously 7-plinerved, the outer pair sometimes faint, sometimes with an additional faint pair, the base acute, the apex acutely acuminate, the upper surface densely covered with paleae adnate except for their appressed terminal setae, the margins ciliate, the under surface villose and on the larger veins somewhat setose.

LUZON, Province of Tayabas (Infanta), mount Binuang, common in mossy forest at and above 900 m, *Bur. Sci. 9370 Robinson*. Named for Doctor B. B. Warriner, with whom I made the ascent, and who was the first to find the species. Closely allied to *M. candidum* D. Don, but distinguished by the much larger bracts, fewer-flowered inflorescences, and by many other characters

MEMECYLON Linn.

Memecylon gracilipes sp. nov.

Arbuscula glabra, ramulis teneris, tereteibus vel apice plus minusve angulatis: inflorescentiis axillaribus, rarissime terminalibus, longiter graciliterque pedunculatis; floribus breviter pedicellatis, parvis, pedicellorum basi solum bracteatis, haud articulatis: foliis breviter petiolatis, lanceolatis, basi acutis, apice longiter acuminatis, uninerviis.

Inflorescences axillary, lateral, or rarely terminal, the slender peduncles 26 to 28 mm long, about 7-flowered, the pedicels about 2 mm long, subtended at the base by lanceolate or ovate obtusely acuminate bracts mostly 0.5 mm long but unequal, no bracteoles upon the pedicels nor at the base of the white flowers, pedicels not articulated: calyx subcampanulate, 1.2 mm long, 1.6 mm wide at the apex, there forming 4 rounded lobes about 0.3 mm long; corolla apiculate in bud, hardly separable into 4 petals about 0.6 mm long; stamens 8, the filaments very short, the anthers about 0.5 mm long, the connective forming an obscure gland upon the back and a short spur at its base; ovary very small, 1-celled with about 8 small ovules; style 1 mm long.

A small tree about 2 m high, its slender branchlets with dark-brownish or gray bark, terete or angled only near the apex, glabrous troughout: petioles about 1 mm long, lamina chartaceous, lanceolate or broadly lanceolate, 22 to 37 mm long, 7 to 12 mm wide, the base acute or subacute, the margins somewhat revolute, the apex forming an obtuse or subacute and often mucronate acumen for about one-third the length of the lamina; under surface tending to yellowish, always paler than the upper; only the costa evident, base traces of other venation only very rarely visible.

LUZON, Province of Ilocos Norte, Mount Dagat, *Bur. Sci. 7753 Ramos*. Very distinct from all other Philippine species in the very slender peduncles of the inflorescence; probably nearest to *M. cumingianum* Presl, differing from it also by the much smaller leaves.

ARALIACEAE.

SCHEFFLERA Forst.

Schefflera binuangensis sp. nov.

Arbor: inflorescentiis terminalibus, paniculatis, sessilibus, dioicis; ramis secundariis brevibus, floribus breviter pedicellatis: foliis longiuscule petiolatis, foliolis 4 vel 5, ovalibus vel oblongo-obovatis, basi acutis, apice acuminatis, venis utrinque 6 ad 8.

Inflorescence terminal, paniculate, 9 cm long, the lower branches arising from its base, the rachis and branches black except where they are covered with gray scurfy pubescence; branches 3 to 7 cm long; secondary branches distant except toward the apices of the primary, 2 to 4 mm long, bearing at their apices 3 to 5 flowers on pedicels about 1 mm long; pedicels continuous with the calyx; only staminate flowers seen; calyx hemispheric, 1 mm long, 2 mm wide, at the truncate apex, tomentellose; corolla calyptrate, but separable into 5 oblong or ovate petals 1.5 mm long, involute and adnate at the apex; stamens 5, inserted on the extreme base of the corolla, alternating with the petals, filaments 0.8 mm long, anthers suborbicular, 0.6 mm long; ovary inferior, 5-celled, often with minute ovules; style entirely wanting.

A tree 8 m high, its trunk 10 cm in diameter, the branches with gray bark: leaves glabrous, palmately 4- or 5-foliolate; petioles 8.5 to 10 cm long, 1.5 mm wide in the middle, conspicuously swollen to 6 to 7 mm at the base, and more gradually and less constantly toward the apex; petiolules 18 to 35 mm long; lamina coriaceous, oval to oblong-obovate, 5.5 to 9 cm long, 3 to 6 cm wide, the base acute, the margins revolute, the apex abruptly contracted into a blunt acumen 8 to 15 mm long; pairs of veins 6 to 8 with others nearly as prominent, loosely and often irregularly anastomosing.

LUZON, Province of Tayabas (Infanta), Mount Binuang, in mossy forest at 930 m elevation, *Bur. Sci. 9435 Robinson.* Closely allied in the nature of its inflorescence to *S. brevipes* Merr., but in *S. binuangensis* this is much shorter, the petioles much longer and not winged, and the leaflets fewer and smaller.

ERICACEAE.

DIPLYCOSIA Blume.

Diplycosia opaca sp. nov.

Arbuscula epiphytica, inflorescentiis exceptis glabra: inflorescentiis axillaribus, 1-ad 3-floris, pedicellis brevibus: foliis ellipticis, coriaceis, basi acutis, apice retusis vel rarius truncatis, crasse apiculatis, margine integris, revolutis; venis utrinque circa 3, obscuris.

Flowers in the axils of present or fallen leaves, 1 to 3 at each node, fascicled, the pedicels 2 to 4 mm long, densely covered with nearly appressed pubescence: bracts at the base of the flowers paired, ovate obtusely acuminate, 2 mm long, pubescent near the margins and ciliate, together resembling a *Cosmarium*; calyx pinkish, urceolate, 3 mm long, divided two-thirds of the way to the base into 5 imbricate, ovate, subacute or obtuse ciliate lobes; corolla still undivided, 2 to 2.5 mm long; stamens 10, 1 mm long, the filaments longer than the unappendaged anthers; ovary glabrous, less than 1 mm long, umbilicate, 5-celled, many-ovuled; style very short, the undivided stigma barely exerted from the umbilicus.

An epiphytic shrub, about 1 m high, the vegetative parts entirely glabrous, the bark of the older stems cinnamon-brown, that of the younger branchlets more often gray: leaves with petioles 5 to 9 mm long, the lamina coriaceous, elliptic, 4 to 8.5 cm long, 2 to 4 cm wide, the base acute, the margins entire, revolute, the apex retuse or merely truncate, shortly and stoutly apiculate, the under surface with scattered, minute, black, glandular dots; all venation except the midrib very indistinct, but the lamina certainly triplinerved, with apparently two additional veins on each side of the midrib.

LUZON, Province of Tayabas (Infanta), Mount Binuang, in mossy forest at an elevation of 900 m, *Bur. Sci. 9385 Robinson.* The leaf-apex seems entirely different from that of any other species of the genus, at once separating it from *D. merrittii*, its nearer Philippine ally.

APOCYNACEAE.

ALYXIA R. Br.

Alyxia monticola sp. nov.

Scandens, Alyxiae luzoniensi Merr. admodum similis, sed differt foliis majoribus longius petiolatis magis acuminatis magis conspicue venosis, et ramis crassioribus.

Cymes axillary, few-flowered: flowers unknown: peduncles stout, about 1 cm long, brown-tomentose; pedicels strongly 4-angled, 3 mm long, 2 mm wide, tomentose; bracts at base of calyx 2, ovate, obtuse, 3 mm long; calyx deeply 5-parted, the segments similar to the bracts but slightly longer, pubescent on the costa and margins; stipe of fruit 6 mm long, pubescent, the fruits oval in outline, not constricted, up to 22 mm long, 12 mm in diameter.

A woody vine, the branches about 5 mm in diameter at the base, the bark drying yellowish-green to dark-brown, the vegetative parts glabrous: leaves in whorls of 4 or 5; petioles 8 to 10 mm long, 1.5 to 2 mm wide; lamina subcoriaceous, oblong or oblong-oblanceolate, 8.5 to 14.5 cm long, 2.5 to 4.8 cm wide, the base acute and decurrent, the margins slightly revolute, the apex abruptly contracted into an obtuse or subacute acumen 8 to 12 mm long; pairs of veins about 50, nearly straight, terminating in a slender lateral vein about 1 mm from the margin, the lamina especially when viewed from the upper surface appearing distinctly margined.

LUZON, Province of Tayabas (Infanta), Mount Binuang, in mossy forest at 840 m elevation, *Bur. Sci. 9359 Robinson*. The nearest alliance of the species seems to be with *A. luzoniensis* Merr., but it differs by the characters noted above. The leaves more nearly resemble those of *A. monilifera* Vidal, but the structure of the fruit is conspicuously different, not constricted, and the size of its single compartment much greater than that of those of *A. monilifera*.

LABIATAE.

ACROCEPHALUS Benth.

Acrocephalus spicatus sp. nov.

Herba, caule tetragono: floribus in capitulis terminalibus interrupte vel subconfluenter spicatis congestis; foliis anguste ellipticis vel anguste lanceolatis, grosse serratis, in petiolum marginatum decurrentibus.

Inflorescence terminal, composed of about 8 interrupted or almost confluent spicate or subspicate heads, or on young branches in single heads, subtended by leafy bracts, the lower 12 mm long, 8 mm wide, decreasing toward the apex; flowering bracts about 3 mm in diameter, suborbicular, acuminate, densely glandular, the outer surface white-villose along 10 to 12 lines near the base, the margins ciliate, each subtending about 10 flowers: calyx tubular, at anthesis the posterior lobe entire, elliptic, about 2.4 mm long, rounded at the apex, ciliate on the margins, the 2 lateral and 2 anterior lobes subequal to one another, definitely shorter than the posterior, linear-lanceolate, ciliate and pointed, each lobe with a median nerve, and separated from one another by a similar nerve, except that the lateral nerves of the posterior lobe are midway between the median nerve and the margin; corolla-tube about 2.6 mm long, 2-lipped for about 0.6 mm, the posterior lip divided into 4 subequal lobes to nearly the depth of the sinus between the lips, the lower lip entire, all lobes lanceolate-ovate, ciliate near their apices; stamens 4, hardly declinate, the filaments swollen in the basal half, the anterior about 0.6 mm long, the posterior shorter, anthers globose, the cells confluent, less than 0.2 mm in diameter; style 2 mm long, shortly bifid at the apex; ovary 4-parted, 0.4 mm long, the glands small: fruiting calyx 5 to 6 mm long, erect or suberect; nutlets ovoid, 0.7 mm long, 0.4 mm wide, minutely tubercular along very numerous longitudinal lines.

A branching herb, nearly 1 m high, the stems quadrangular except near the base, reddish and shortly villose on the angles, greenish and more densely pubescent in the furrows: leaves opposite or falsely whorled by the presence of similar but smaller ones which are at least sometimes the first on short lateral branches, narrowly elliptic or narrowly lanceolate, including the petioles 3 to 7 cm long, 6 to 12 mm wide, the base gradually narrowed into the margined petiole, the lamina with 3 to 5 comparatively large teeth on each margin, acute at the apex, both surfaces glabrous or subglabrous except on the veins, densely glandular; pairs of veins equal in number to the teeth.

MINDANAO, District of Davao, Santa Cruz, *Williams 2954* (type): District of Lanao, Camp Keithley, *Mrs. Clemens 741*. The species is very distinct from *A. indicus* (Burm.) O. Ktze., in the nature of the inflorescence; it is less certainly distinct from *A. blumii* Benth. (*Ocimum acrocephalum* Blume), but the inflorescence of that species is described as capitate, and it has been reduced to *A. indicus*. Blume's description is so short that it is difficult to draw conclusions. Nearly all the flowers on the type are smaller than herein stated, the figures are taken from the largest seen. The plant has much the habit of a *Dysophylla* or of *Hyptis spicigera* Lam.

RUBIACEAE.

MUSSAENDA (Burm.) Linn.

Mussaenda lanata sp. nov.

Frutex vel arbuscula; inflorescentiis terminalibus, floribus spicatis; calycis lobis 5, lanceolatis, deciduis; corolla aurantiaca, infundibuliforme, limbo breviter lobato, lobis margine superiore truncatis apice breviter apiculatis; ovario biloculare, multiovulato: foliis longiter petiolatis, laminis chartaceis, ovatis vel orbicularibus, basi acutis, apice acuminatis vel subacutis, venis utrinque circiter 13, tota planta, caulibus vetustioribus exceptis, dense pubescens.

Flowers spiked in terminal subcorymbose inflorescences 10 to 20 cm long, the rachises fleshy, densely hoary- and brownish-pubescent; bracts linear-lanceolate or lanceolate, 5 to 7.5 mm long: calyx-tube 8 to 9 mm long, about 4 mm in diameter at the apex; calyx-lobes 5, lanceolate, 5.5 to 6.5 mm long, acute at the apex, deciduous, one of the lobes sometimes leaf-like, white, 5 cm long, the blade oval, 5-nerved, acutely acuminate at the base; corolla-tube 13 mm long, the lobes 5, valvate, about 1.5 mm long and 3.5 mm wide, very densely brown-tomentose within, the throat yellow-tomentose, the belt occupied by the anthers white-tomentose; stamens 5, the filaments free from above 4 to 5 mm from the base of the corolla-tube, about 2 mm long; anthers lanceolate, nearly 4 mm long; style inserted in a pit formed by the short, white, free portion of the ovary, entire for 2 mm, then 2-lobed for 1.5 mm; ovary 2-celled, each cell containing very many small ovules; fruit fleshy, ovoid-globose, about 1 cm in diameter.

A shrub or small tree, 2 to 3.5 m high, the bark of the older branches gray, the younger branchlets greenish-gray, somewhat angled: leaves of a pair usually unequal, the petioles 2 to 8 cm long, the lamina chartaceous, orbicular to ovate, 12 to 24 cm long, 9 to 12 cm wide, acutely acuminate at the base, at the apex subacute or forming a short acumen; primary lateral veins on each side of the costa usually 13; stipules interpetiolar, ovate, long-acuminate, 8 to 18 mm long; upper surface of the lamina dark-green, under surface light-green, both, but especially the under, covered with soft whitish pubescence.

LUZON, Subprovince of Abra, Manapnap, *Bur. Sci. 7254 Ramos:* Subprovince of Bontoc, Bauco, *Vanoverbergh 1195:* Subprovince of Benguet, near Baguio, *Merrill 6681* (type), *For Bur. 5078 Curran*, *Elmer 8976*, *Bur. Sci. 5827 Ramos;* Sablan, *Elmer 6195*, *Bur. Sci. 12588 Fénix*, *Williams 1558;* Itogon, *Williams 1001:* Province of Zambales, Balimbraya, *Bur. Sci. 5044 Ramos.* Allied to *M. anisophylla* Vidal and *M. villosa* Wall., differing from both in the thicker, more densely pubescent, and usually larger and more numerously veined leaves, from the latter also in habit and by longer and thicker petioles.

THE PHILIPPINE

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CYATHEAE SPECIES NOVAE ORIENTALES.

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Cyathea subsessilis Copel. sp. nov.

Fronde 110 cm alta, 40 cm lata, subsessile, utrinque angustata; stipite 5 cm vel ultra alto, sparse tuberculato, supra paleis fuscis 2 cm longis ornato; rhachi sursum glabrescente inerme, deorsum simul stipitis; pinnis infimis sensim valde reductis, medialibus 22 cm longis, subsessilibus, acutis, rhachibus quadratis, supra hirsutis, infra glabris, inermibus; pinnulis 3–4 cm longis, 10–12 mm latis, sessilibus, obtusis, subcoriaceis, fere ad costam pinnatifidis, costa supra setosa, aliter glabris; segmentis 5 mm longis, 3 mm latis, rotundatis, subintegris; venis utroque latere 3–5, plerumque furcatus et in ala soriferis, soris subcostularibus, indusio nitido, laete brunneo, primo mammiforme.

SAMOA, Savaii, Maugaloa, *Vaupel, Plantae Samoenses 424*, March, 1909.

A decidedly peculiar and distinct species.

Cyathea deorsilobata Copel. sp. nov.

Rhachi fere 2 cm crassa glabra, brunnea, aculeolata; pinna 65 cm longa, 25 cm lata, brevistipitata, rhachi minutius tuberculata, glabrescente; pinnulis sessilibus, 12.5 cm longis, 3 cm latis, caudatis, rhachi deorsum infra minute furfuracea, supra pilis sparsis ochroleucis ornata, sursum glabra; pinnulis $^{\mathrm{II}}$ infimis subsessilibus, sequentibus adnatis falcatis, obtusis, herbaceis, supra costaque glabris atroviridibus, infra minutissime hirsutis, parte inferiore pinnulae quaeque fertile et inciso-serrata, versus apices integris; venis utroque latere ca. 15, inferioribus bis furcatis; soris in alis superioribus insertis, medialibus, laete brunneis, indusio tenue, persistente.

SAMOA, Savaii, Maugaloa, alt. 800 m, *Vaupel, Plantae Samoenses 471*, March, 1906.

Near *C. affinis* (Forst.) Swtz., but conspicuously different in texture and in having the secondary pinnules broad and entire near the obtuse tip. *C. suluensis* Baker and *C. Cumingii* Baker, differ in having their pinnules entire throughout.

Cyathea leichardtiana (F. v. Muell.) Copel. comb. nov.

Alsophila leichardtiana F. v. Muell. Fragm. 5 (1865) 53.

We have this fern, from Killarney, from the Queensland Herbarium, under the name *Alsophila australis*. The two are readily distinguished by the character of the rachis.

Cyathea propinqua Mett. has been a veritable drag-net. The two following species received here under this name agree with it in the origin of the lowest inferior vein, naked rachises, and texture, but are otherwise very distinct, and the second is hardly to be regarded as a near relative.

Cyathea Vaupelii Copel, sp. nov.

Species gregis C. propinquae Mett. et sub nomine illo distributa, sed facile ob pinnam sessilem, pinnulam obtusam, costam infra minute squamuliferam et lacinias serrulatas distinguenda. Rhachibus infra glabris, stramineis vel brunneis, inermibus; pinna ca. 40 cm longa, acuta; pinnulis sessilibus 6 cm longis, 17 mm latis, vix ad costam pinnatifidis; segmentis 5 mm latis, obtusis, subfalcatis, sursum serrulatis, glabris, herbaceis; venis utroque latere ca. 6 quarum plerumque 4 furcatis fertilibus; soris medialibus, indusio membranaceo, persistente.

SAMOA, Savaii, Vaipouli, *Vaupel, Plantae Samoenses 184*.

Cyathea Betchei Copel, sp. nov.

Rhachibus infra glabris, stramineis, inermibus; pinna 60 cm longa, 22 cm lata, stipitata; pinnulis infimis reductis et deflexis, sequentibus stipitatis, horizontalibus, acuminatis, usque ad 25 mm latis, deorsum ad costam infra nigrescentem minutissime squamuliferis, supra pallide hirsutis; pinnulis ^{II} infimis vix adnatis rhachiscopice hastatis; segmentis medialibus pinnulae ^{I} 3 mm latis, serratis sursum integrioribus, acutis, subfalcatis, herbaceis, supra atroviridibus glabrescentibus, infra pallidis secus marginem densius alibi sparse squamulis minutis albidis vestitis; venis utroque latere 10-12, plerisque, furcatis; soris medialibus, indusio globoso, membranaceo, non persistente.

SAMOA, Upolu, leg. *E. Betche*, 1881. Comm. National Herbarium of New South Wales.

Cyathea truncata (Brack.) Copel. comb. nov.

Alsophila truncata Brack. U. S. Expl. Exp. 16 (1854) 289.

Our specimen (*Vaupel, Plantae Samoenses 430*), is a pinna nearly 60 cm long, 16 cm wide. The secondary pinnules are auriculate on the upper side.

Cyathea hemichlamydea Copel. sp. nov.

Stipite nigro, spinis parvis munito, supra paleis atro-castaneis linearibus rigidis 15 mm longis vestito, infra pinnas infimas reductas remotas ca. 30 cm alto, utroque latere faciei superioris serie aerophorum linearium ornato; rhachi infra nigra, tuberculata, glabrescente; pinna 45 cm longa, 18 cm lata, sessile, acuminata, rhachi infra minute tuberculata, pilis minutis deciduis adspersa, supra pilosa et paleis linearibus sparsissime vestita; pinnulis infimis reductis, sequentibus 9 cm longis, 2 cm latis, acuminatis, basi subsessile inaequale, fere ad costam supra pilosam infra paleaceam pinnatifidis; segmentis proximis, 3–4 mm latis, apice rotundatis et serrulatis, herbaceis, lamina glabra, costulis supra glabris, infra subsquamuliferis; venis utroque latere ca. 7, inferioribus furcatis; soris costularibus inferioribus paullo remotioribus, indusio faciem costularem sori solummodo subtegente.

BORNEO, Sambas, Beng Karum Mountain, alt. 900 m, *Brooks 102*.

Like *C. heterochlamydea* Copel. of the Philippines in the peculiar indusium.

Cyathea inciso-serrata Copel. sp. nov.

Rhachi brunnea, minute et sparse punctulata, infra glabra vel glabrescente, supra minute velutina; pinna ca. 50 cm longa, 15 cm lata, subsessile, acuminata, rhachi infra paleis minutis angustis paucis sparse vestita, inerme; pinnulis inferioribus paullo diminutis, sequentibus brevistipitatis, 8 cm longis, usque ad 25 mm latis, acuminatis, fere ad costam in segmenta 4 mm lata obtusa inciso-serrata herbacea incisis, segmento infimo basiscopico reducto integro, costa infra paleis fusco-ferrugineis lanceolatis interdum bullatis vestita, supra pilosa; costula supra glabra, infra squamulis bullatis caducis vestita; venis bis furcatis, soris in alam superiorem insertis, indeque medialibus; indusio nullo, paraphysibus multis, sporangia paullo superantibus.

SARAWAK, Mount Singie, alt. 600 m, *Brooks 105*.

Near *C. assimilis* Hook., but more ample, and exindusiate.

Cyathea ampla Copel. sp. nov.

Apice truncis radices emittente, paleis crinito-subulatis fulvis angustissimis 2–2.5 cm longis densissime obtecto; stipite basi paleis latioribus 1-2 cm longis ciliatis ad latera vestito, sursum glabrescente castaneo, verruculoso; rhachibus tomento minuto lacerato castaneo partim hic illuc deciduo vestitis, castaneis, inermibus; pinnis stipitatis, medialibus maximis, 40 cm longis, fere 20 cm latis, acutis; pinnulis stipitatis, inframedialibus maximis, 10 cm longis, 2.5 cm latis, pinnatifidis vel basi pinnatis et pinnulis^{II} plerumque adnatis, diminutis; segmentis 6 mm latis, obtusis, sursum grosse serratis, herbaceis, lamina glabra, infra pallidiore, costis supra minute pilosis, infra rarius costulisque deorsum squamulis minutis atropurpureis laceris vestitis; venulis utroque latere ca. 7, inferioribus bis furcatis; soris alis superioribus earum insertis indeque fere marginalibus, indusio hyalino mox fisso.

SARAWAK, Mount Singie, *Brooks 106.*

Cyathea leucocarpa Copel. sp. nov.

Trunci apice et basi stipitis radicibus spinosis et paleis atrocastaneis nitidis subulatis rigidis 1 cm longis obtectis; stipite ultra 30 cm alto, castaneo, basi nigrescente, tomento ferrugineo deciduo vestito, verruculoso, basi 1–1.5 cm crasso; rhachibus rufis, infra primo paleis concoloribus minutis vestitis, glabrescentibus, fere inermibus; pinnis subsessilibus, 45 cm longis ca. 13 cm latis, acuminatis; pinnulis brevistipitatis, 7.5 cm longis, 15 mm latis, acuminatis, basi truncatis, fere ad costam pinnatifidis; segmentis 3.5 mm latis, apice rotundatis, obscure serrulatis, lamina glabra membranacea, costa supra saturate rufo-pilosa, infra paleis opacis integris acuminatis sparsis vestita, costulis squamulis bullatis sparsis ornatis; venis utroque latere ca. 8, plerisque furcatis; soris in alis venarum insertis, indeque subcostularibus, de lamina superiore conspicue immersis, exindusiatis, primo ob paraphyseos fulvo-rufis, dein ob sporangia exposita albidis.

SARAWAK, Mount Singie, alt. 600 m, *Brooks 107.*

Near to *C. melanopus* (Hassk.) Copel.

Cyathea poiensis Copel. sp. nov.

Trunco teste Brooks ca. 90 cm alto; stipite inerme ca. 18 cm longo, castaneo, pedem versus paleis integris lanceolatis 1 cm longis ferrugineis vestito et ramis paucis subacanthoideis 2–3 cm longis munito; fronde vix 1 m alta, 40 cm lata, utrinque angustata, rhachi dense strigosa non paleacea; pinnis infimis diminutis et deflexis; medialibus 23 cm longis, 6 cm latis, stipitatis, acuminatis, rhachi ut frondis; pinnulis infimis reductis, sequentibus 3 cm longis, 9 mm latis, brevistipitatis, basi cuneato-truncatis, apice rotundatis, $\frac{1}{4}$ ad costam pinnatifidis, lobis 2.5 mm latis, integris, subfalcatis, obtusis, lamina subcoriacea, glabra, infra pallida: costa supra doersum pilosa, infra pilis et squamulis bullatis mixtis vestita, costulis sparse squamuliferis, venis utroque latere 3-4, simplicibus; soris medialibus, parvis, indusio nullo vel transeunte.

SARAWAK, Mount Poi, alt. 900–1,200 m, common but seldom fertile, *Brooks 101.*

Cyathea stipitulata Copel. sp. nov.

Species gregis C. integrae Baker, C. polypodae Baker affinis; rhachi inerme sordide brunnea subtus glabrescente, supra minute adpresso-tomentosa; pinnis patentibus, 40 cm longis, 12 cm latis, brevistipitatis, acutis, costa quadrangulari subtus sparse furfuracea, badia; pinnulis utroque latere 20–25, stipitatis stipitibus 3 mm longis tomentosis, valde cordatis, horizontalibus, basi 14 mm latis, sursum sensim angustatis, fere ad costam pinnatifidis, costis supra badio-piliferis, subtus basibusque costularum squamulis castaneis plerisque laceris sparse vestitis; segmentis ca. 4 mm latis, oblongis, obtusis, crenulatis, subcoriaceis, glabris; venulis utroque latere ca. 6; soris globosis, medialibus, indusio fere 1 mm diametro, badio, sat persistente.

SARAWAK, Mount Matang, alt. 300 m, *Brooks 104*.

"The base of the stipe slightly spiny with numerous lanceolate brown scales 2 cm long."

Cyathea longipinna Copel. sp. nov.

Arbor alta C. melanopodi (Hassk.) affinis, qua specie rhachi castanea tuberculata pinnis angustis basi haud angustatis, costis infra paleaceis, et segmentis serratis differt; stipite basi castaneo nitido, paleis atrocastaneis nitidis lineari-sublulatis 1 cm longis caducis vestito, ubique spinoso; rhachi glabrescente, spinulosa, sursum rhachibusque badiis pinnarum tuberculatis; pinnis ca. 45 cm longis, 9–11 cm latis, infimis stipitatis reductis et deflexis utrinque angustatis, medialibus maximis, horizontalibus, sessilibus, acutis, rhachi supra velutina, subtus glabra, basi incrassata, pilosa, et sursum ad rhachin frondis macula parva pallida notata; pinnulis utroque latere ca. 30, sessilibus, horizontalibus, plerisque rectis a basibus 9–11 mm latis ad apices serratos sensim angustatis, vix ad costas pinnatifidis, costa supra deorsum velutina infra paleis stramineis vel badiis ovatis dense vestita; segmentis proximis, 2 mm latis, subfalcatis, obtusis, infra pallidis, lamina glabra herbacea; costulis infra inter soros paleaceis, aliter glabris; venis fructiferis furcatis, superioribus simplicibus; soris costularibus exindusiatis, badiis, contiguis et confluentibus.

SARAWAK, Mount Matang, alt. 800 m, *Brooks 103*.

Cyathea trichophora Copel. sp. nov.

Stipite 50 cm alto, basi paleis stramineis acicularibus 1 cm longis dense, supra basin superne paleis concoloribus 15 mm longis 2 mm latis vestito, sursum decidue pilifero, asperulo; fronde ca. 120 cm alta, 50–60 cm lata, utrinque angustata; pinnis infimis 10 cm longis, deflexis, vix pinnatis, medialibus maximis, 30–35 cm longis, 10 cm latis, subsessilibus, rhachibus pilis albidis 2 mm longis vestitis; pinnulis sessilibus, ca. 5 cm longis, 1 cm latis, obtusis, basi cuneato-truncatis ultra medium laminam pinnatifidis, herbaceis, pallidis, lamina glabra, costis infra sparse piliferis et squamuliferis; lobis truncatis, denticulatis, 3–4 mm longis, 2–3 mm latis, proximis; venulis utroque latere lobi 4–5, plerisque simplicibus; soris medialibus, vix 1 mm latis, indusio vestigiale vel nullo, sporangiis cum paraphysibus mixtis.

LUZON, Pronvice of Laguna, San Antonio, *Phil. Pl. 949 Ramos*, August, 1910. *Bur. Sci. 12053 Ramos* from the same locality is the same species, and in full fruit, but the frond in only 22 cm wide and barely bipinnate. In appearance it is remarkably like *Dryopteris Filix-Mas* var. *parallelogramma*.

Very distinct from any of our other species.

Cyathea auriculifera Copel. sp. nov.

Rhachi castanea, minute furfuracea, sparse et minute echinulata; pinna mihi missa 50 cm longa, 12 cm lata, fere sessile, rhachi sub indumento denso minuto castaneo nigra sparsissime echinulata; pinnulis subsessilibus, horizontalibus, 14 mm latis, abrupte acutis acumine integro, ubique pinnatis; pinnulis II brevistipitatis, 2 mm latis, obtusis, inferioribus utroque latere auricula una suborbiculare libera ornatis, aliter integris, medialibus basi truncatis et inaequilateralibus, supra glabris et viridibus, infra sparse paleaceis et perpallidis; venis utroque latere 7 vel 8, inferioribus furcatis, medialibus solummodo fertilibus; soris costalibus, confertis, laete brunneis, indusio membranaceo.

Papua, Goodenough Bay, alt. 1,200 m, growing in scrub. *C. King 227.*

A very peculiar species, which, in form only, is somewhat suggestive of *C. truncata.*

A diagnosis was also prepared for *Cyathea botryocarpa*, founded on No. 57 *King*, but in the meantime Rosenstock has published this as *Alsophila biformis* in Fedde's Repertorium **9** (1911) 423, issued August 15. Assuming that "*biformis*" and "*dimorpha*" are properly different names, I will call this **Cyathea biformis** (Rosenstock) comb. nov.

Rosenstock also describes *Cyathea Kingii*, based on King's No. 277. I have three sheets of this fern, and do not see why it should not be called *Cyathea fusca* Baker. Beside these two Cyatheas, Rosenstock publishes six new species from King's collection; I published three of these six weeks earlier, and one *Pteris gracillima*, is not new. When I put Mr. King in communication with the Buitenzorg Garden, I did not suspect that it would result in double publication, or in my having to publish in haste to avoid it.

The Philippine Journal of Science, C. Botany.
Vol. VI, No. 6, December, 1911.

SIMARUBACEARUM GENUS NOVUM PHILIPPINENSE.

Auctore L. Radlkofer.
(*Munich, Bavaria.*)

HEBONGA Radlk. gen. nov.

(*Aglaia* sp. Merrill in sched. et in Diction. Plant Names Philip. Islands (1903) 66[1], vulgo Hebong in lingua Mangyan ex Merrill in sched. et l. c.)

Flores unisexuales, dioeci? (masculi tantum visi), parvuli. Calyx minutus, profunde (4–) 5-partitus, partibus deltoideis patulis vix ima basi subimbricatis puberulis glandulisque raris capitatis breviter stipitatis adspersis, intus glabris, cellulis resinigeris parce persitis. Petala (4–) 5, calyce pluries longiora, ex obovato-lanceolato cuneata, acuta, margine apiceque subinflexa, valvata, nervo mediano prominulo, venis arcuato-recurvis anastomosantibus teneris, oblique patula, praeter extimum apicem minutim puberulum utrinque glabra, e flavido fuscescentia, cellulas resinigeras paucas foventia. Stamina 10, cum petalis sub disco inserta, petalis sesquilongiora; filamenta filiformia, subflexuosa, glabra (squamulis basi nullis); antherae in alabastro extrorsae, suborbiculares, supra basin emarginatam prope medium ventrem affixae, longitudinaliter dehiscentes; pollinis granula trigono-subglobosa, triporosa. Discus parvus, annularis, tumidus, medio paullum depressus, glaber. Pistilli rudimentum in disci centro minimum, ovatum, anceps, 2-loculare, loculis superne liberis, singulis in apiculum (stylum rudimentarium) parvum subincurvum desinentibus; gemmulae rudimentariae in loculis solitariae, angulo centrali insertae. Flores feminei fructusque ignoti.

Arbores. Rami—(folia decerpta tantum visa paniculaeque). Folia magna, imparipinnata, 8- ad 15-juga, longiuscule petiolata; foliola opposita vel superiora alterna, intermedia quam infima summaque majora (ad 18 cm longa, 5 cm lata), nunc elongate ovato-lanceolata, subfalcata, inaequilatera (latere interiore latiore longioreque), acutata, basi valde obliqua (*H. obliqua*), nunc elliptica, subacuta, parum inaequilatera (*H. mollis*), petiolulata, integerrima, coriaceo-chartacea, sicca fragilia, pinnatinervia, nervo mediano supra costula acuta notato infra obtuse prominente striato ductibus resinigeris (supra singulo, infra duobus juxtapositis) percurso, lateralibus supra subimpressis subtus prominulis oblique patulis ante marginem bifurcatis et anastomosantibus (ductibus resinigeris destitutis), glabriuscula vel subtus molliter pubescentia (*H. mollis*), pilis 1-cellularibus pachydermicis curvatis basi dilatatis, fuscescentia, subopaca, subtus papillosa, papilliis brevibus obtusis cuticula striata obductis, nunc e media tantum (*H. mollis*), nunc e tota cellularum superficie emergentibus tumque basi contiguis (*H. obliqua*), diachymate (ut et cortice petioli) cellulis resinigeris persito, epidermide paginae superioris mucigera; petiolus teres, ima basi complanatus et quodammodo dilatatus, ut et rhachis teretiuscula paullulum complanata supra linea elevata notata ductibus resinigeris compluribus intra et prope medullae coronam nec non supra vasorum fasciculos accessorios per medullam in seriem transversalem dispositis percursus. Paniculae axillares? (decerptae tantum visae), fere dimidiam foliorum partem aequantes, pauciramosae, subferrugineo-puberulae, pilis crispulis transversim pluriseptatis, rhachi superne ramis ramulisque conferte cincinnos sessiles glomeruliformes gerentibus iisque ductibus resinigeris ad medullae peripheriam percursis; alabastra primum globosa subsessilia, denique claviformia, 3 mm longa, pedicellis aequilongis puberulis suffulta; bracteae bracteolaeque minutae, deltoideae, puberulae. Flores expansi diametro ca. 6 mm.

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[1] Govt. Lab. Publ. (Philip.) 8 (1903).

Species 2, philippinenses.

Genus floris, praesertim gynoecii indole antherisque extrorsis nec non characteribus anatomicis (ductibus resinigeris medullaribus usque nervum foliolorum medianum extensis) affine videtur generi *Soulamea;* differt habitu, petalis valvatis, cellulis quoque resinigeris (non solum ductibus) per foliola et floris partes dissitis atque foliolis subtus papillosis, quibus rebus inter Simarubaceas stamina esquamata exhibentes quodammodo accedit ad quasdam *Ailanthi* species. Veram affinitatem fructus docebit.

1. **H. obliqua** Radlk. sp. nov.

Aglaia sp. Merrill, cf. supra. Vulgo *Hebong*, cf. supra.

Folia praelonga, ad 15-juga; foliola opposita vel superiora alterna, elongate ovato-lanceolata, subfalcata, inaequilatera, apice sensim acutata, basi quam maxime obliqua, latere interiore latiore longioreque rotundato (fere semicordato), latere exteriore angustiore breviore sensim angustato, longiuscule petiolulata, petiolulis angulosis, subcoriacea, glabra, subtus papillis latioribus obtuse conicis ornata, fusco-olivacea; reliqua generis.

Arbor 12 m alta. Folia petiolo adjecto 50 cm aequantia vel paullo superantia; foliola cum petiolulis 1 cm longis ad 18 cm longa, 4.5 cm lata. Paniculae rami 15 cm longi.

In Philippinarum insula Mindoro: *E. D. Merrill n. 2176!* (Bongabong, m. Maj. 1903, alab.; Hb. Manil.); *E. Hickmann n. 6!* (ibid., m. Febr. 1903, alab.; id. Hb.).

2. **H. mollis** Raldk. sp. nov.

Folia sat longa, ca. 8-juga; foliola opposita, elliptica, subacuta, basi paullulum inaequilatera, oblique subovata, brevius petiolulata, petiolulis complanatis, chartacea, supra praeter nervos laxe puberulos glabra, subtus molliter pilosa et papillis tenuioribus rotundato-capitatis ornata, olivaceo-viridia; reliqua generis.

Folia petiolo 11 cm longo adjecto ad 50 cm longa; foliola cum petiolulis 5 mm longis ad 13 cm longa, 5 cm lata. Paniculae 22 cm longae, ramis 10 cm longis.

In Philippinarum insula Mindanao: *H. N. Whitford et W. I. Hutchinson For. Bur. n. 9448!* (Zamboanga, m. Febr. 1908, flor.; ex H. Manil. comm.).

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THE PHILIPPINE SPECIES OF BEGONIA.

By E. D. MERRILL.

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In the pre-Linnean botanical literature I have found but a single reference to Philippine *Begonia*, *Acetosa nigritarum* of Kamel, published in Ray's "Historia Plantarum,"[1] and on which Steudel later based the name *Begonia nigritarum*. Except for the somewhat casual mention of *Acetosa nigritarum* by Dryander,[2] no additional references to the Philippine species are to be found until the publication of Blanco's "Flora de Filipinas" in 1837, where a single species is described, but erroneously referred to *Begonia capensis* L. No additional forms are included in the second edition of Blanco's work, nor in the third, so far as that edition is a reprint of the second. *Begonia capensis* Blanco, non L., is manifestly identical with *Acetosa nigritarum* Kamel = *Begonia nigritarum* Steud. (*B. rhombicarpa* A. DC.).

In 1854 A. Gray described two additional species of Philippine *Begonia* and credited a third to the Archipelago, based on material collected in Luzon by the Wilkes U. S. Exploring Expedition,[3] and in the same year Klotzsch[4] published the description of a single species, as *Petermannia,* identical with one described by Gray.

In 1864 A. DeCandolle's monograph of the family appeared[5] in which 10 species in two genera were credited to the Archipelago. The number of species was increased to 13 by F.-Villar in 1880[6] but Villar's list is reliable only so far as he followed DeCandolle's monograph as to species credited to the Archipelago by the latter author.

In 1904 Warburg published the descriptions of 10 additional Philippine species of *Begonia*,[7] making a total of about 20 valid species definitely known from the Archipelago at the beginning of botanical exploration under the American administration. Since that date a few additional species have been described in the publications of the Bureau of Science, and in 1910 five species were described by Mr. Elmer under the title "New Species of Begonia."[8] In this last paper the sections to which the several species belong are not indicated, and through oversight the capsules are all described as the "seed"; in this paper it is well to note that the capsule descriptions and measurements are exclusive of the wings, while in the following enumeration the descriptions and measurements include the wings.

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[1] 3 Suppl. (1704) 14.
[2] Trans. Linn. Soc. 1 (1791) 171.
[3] Bot. Wilkes U. S. Explor. Exped. (1854) 658.
[4] Monatsber. Berl. Akad. (1854) 124.
[5] Prodr. 15 (1864) 266–408.
[6] Nov. App. (1880) 98–99.
[7] Perk. Frag. Fl. Philip. (1904) 51–56.

As arranged in the present paper the Philippine material available for study is distributed among fifty-nine species, all of which are apparently endemic. The majority of the species are referable to two sections, *Petermannia* and *Diploclinium*, both of which reach their maximum development in the Philippines. A single species is referable to the very distinct section *Sphenanthera*, which has been treated by several authors as worthy of generic rank, and one of two of the forms treated under the section *Diploclinium* may eventually prove to be referable to some other section.

The greater proportion of our species are of local occurrence, their ranges being much restricted, which in general is true of the entire family. A few, such as *Begonia nigritarum* Steud., as interpreted by me, and *B. pseudo-lateralis* Warb., are found in most parts of the Archipelago in proper habitats.

Here as elsewhere, Begonias are found in shaded, especially damp ravines, on banks and cliffs along small streams especially on seepage slopes, rarely on the broader slopes in forests. Some are found on more or less exposed cliffs that become thoroughly dry in the dry season, others are never found except in perennially damp and shaded ravines, and still others are never found outside of the limits of the mossy forests on our higher mountains. Most of the species do not seem to have a great altitudinal range, but *Begonia nigritarum*, as here interpreted, extends from sea level in some regions to an altitude of about 1,200 meters in other regions.

In Manila a number of exotic forms are cultivated by local gardeners, but no attempt has been made to determine these in the present paper. It is believed, however, that many of our indigenous species are worthy of cultivation as ornamental plants, although little attempt seems to have been made to introduce our local forms into cultivation. *Begonia nigritarum* is not infrequently found in local gardens, but this is the only endemic species I have observed in Manila. Probably the chief reason why more of the local forms have not been successfully cultivated in Manila is that the climatic conditions in the vicinity of the city are

[8] Leafl. Philip. Bot. 2 (1910) 735–740.

not especially adapted to the culture of species that require a relatively high humidity.

The majority of our species apparently have well developed distinguishing characters, but in some groups, notably *Begonia nigritarum* and its immediate allies, distinctive characters are rather obscure, and the present treatment of the *Begonia nigritarum* group, as well as of some others will doubtless be modified in the future as more material becomes available for comparison. Another group of closely allied forms are the five species including and following *Begonia klemmei.* Frequently specimens will be found that in vegetative and floral characters so closely resemble each other that it is difficult or impossible to distinguish between them, yet when mature fruits are secured, the capsules will be found to be entirely different, hence the desirability of securing as nearly complete material of each species as is possible.

In addition to the rich collections of Philippine material in the Herbarium of the Bureau of Science, the author has had an opportunity to examine types of cotypes of nearly all the Philippine species preserved in various American and European herbaria, and several of the species described by European authors are represented in the Herbarium of the Bureau by cotypes.

Although in the following enumeration the number of Philippine species has been increased to fifty-nine, it confidently is expected that future botanical exploration will add a number of additional forms. In the time that elapsed between the inception and completion of the manuscript of the present paper about 15 distinct forms were added to the collections through the medium of recent botanical exploration, while several apparently undescribed species are represented in the herbarium by incomplete material.

KEY TO THE PHILIPPINE SPECIES OF BEGONIA.

1. Capsules not or very tardily dehiscent, very obscurely or not at all winged; coarse, erect, branched herbs with rather dense, axillary inflorescences. § SPHENANTHERA .... 1. *B. pseudo-lateralis*
1. **Capsules distinctly winged, dehiscing early.**
 2. **Staminate flowers with 2 sepals and no petals, or petals very rarely present; erect, more or less branched or simple plants, herbaceous or suffrutescent.**
 § PETERMANNIA.
  3. **Staminate and pistillate flowers axillary, solitary or fascicled.**
   4. **Leaves strongly and obliquely cordate at the base..........** 2. *B. robinsonii*
   4. **Leaves gradually narrowed to the acute or obtuse, slightly inequilateral, scarcely or but slightly cordate base.**
    5. Stems and leaves rather densely clothed with long, slender, brown hairs .... 3. *B. ciliifera*
    5. **Whole plant glabrous or only slightly hairy.**
     6. **Leaves distinctly and irregularly lobed............** 4. *B. mindanaensis*
     6. **Leaves not lobed, irregularly dentate or denticulate.** 5. *B. fasciculiflora*

3. Flowers in terminal or axillary small to large panicles or racemes.

4. Leaves more or less narrowed on both sides of the midrib toward the often subequilateral base.

5. Leaves quite glabrous.

6. Leaves distinctly obliquely cordate at the base...... 6. *B. agusanensis*

6. Leaves subobtuse or acute at the base, not obliquely cordate.

7. Leaves 5 to 8 cm long.

8. Capsule equally 3-winged .... 7. ***B. brevipes***

8. Capsule unequally 3-winged .... 8. ***B. littleri***

7. Leaves 10 to 15 cm long.

8. Capsules nearly 2 cm long .... 9. ***B. longistipula***

8. Capsules less than 1.5 cm long .... 10. ***B. palawanensis***

5. Leaves densely brown-setose or pubescent on the nerves on the lower surface.

6. Leaves subentire or obscurely undulate-lobed near the apex. 11. ***B. leptantha***

6. Leaves distinctly angular-lobed or toothed.

7. Margins with few, short, coarse, triangular lobes.... 12. ***B. weberi***

7. Margins sharply toothed or sublobed, the teeth numerous, small or of medium size.

8. Leaves less than 2 cm wide .... 13. ***B. loheri***

8. Leaves 3.5 to 6 cm wide .... 14. ***B. jagori***

4. Leaves not narrowed to the base which is always strongly cordate and inequilateral.

5. Leaves deeply laciniately pinnatifid.. 15. ***B. incisa***

5. Leaves entire, toothed, or lobed, not laciniate.

6. Leaves prominently pubescent at least on the nerves on the lower surface.

7. Leaves suborbicular or reniform .... 16. ***B. mearnsii***

7. Leaves oblong.

8. Capsule less than 1 cm long .... 17. ***B. leytensis***

8. Capsules 1.5 to 2.5 cm long.

9. Inflorescence short, congested, 3 cm long or less, the flowers subtended by large bracts.......................... 18. ***B. crispipila***

9. Inflorescence lax, the bracts none or small and early deciduous. 19. ***B. cumingii***

6. Leaves glabrous or nearly so.

7. Capsules 2 to 2.5 cm long.

8. Staminate flowers small; leaves mottled .... 20. ***B. leucosticta***

8. Staminate flowers large; leaves not mottled.. 21. ***B. negrosensis***

7. Capsules less than 2 cm long.

8. Male flowers exceeding 2 cm in diameter.

9. Leaves 14 to 30 cm long; staminate flowers 2 to 2.5 cm in diameter .... 22. ***B. halconensis***

9. Leaves less than 10 cm long; male flowers 3 to 3.5 cm in diameter .... 23. ***B. merrittii***

8. Male flowers less than 1.5 cm in diameter.

9. Capsule about 1.5 cm long.

10. Leaf-margins subentire or toothed, not lobed. 24. ***B. contracta***

10. Leaf-margins coarsely angularly lobed.. 25. ***B. quercifolia***

9. Capsules 10 to 12 mm long.

10. Leaf-margins ciliate-denticulate .... 26. ***B. bolsteri***

10. Leaf-margins not ciliate-denticulate........... 27. ***B. ramosii***

4. Leaves not narrowed below, obliquely truncate or obtuse at the base, not cordate.

5. Leaves brown-setose or pubescent at least on the nerves on the lower surface.

6. Petioles 0.5 cm long; leaves setose only on the nerves. 28. *B. cumingiana*

6. Petioles 1 to 1.5 cm long; leaves setose on all parts of the lower surface .... 29. *B. risalensis*

5. Leaves glabrous or nearly so.

6. Leaves minutely and sparingly brown-furfuraceous on the lower surface; flowers vermillion .... 30. *B. esculenta*

6. Leaves quite glabrous; flowers pink.

7. Capsules 2 cm long, truncate........ 31. *B. subtruncata*

7. Capsules less than 2 cm long.

8. Staminate flowers 1 to 1.2 cm in diameter; capsules more than 1.5 cm long .... 32. *B. everettii*

8. Male flowers 2.4 cm in diameter; capsules less than 1 cm long. 33. *B. malindangensis*

. Staminate flowers with 2 sepals and 2 petals; herbs with prostrate stems, terrestrial or growing on the trunks or branches of trees, rooting throughout their length and sending out scattered leaves and flower-scapes. § DIPLOCLINIUM.

3. Leaves peltate, rounded at the base, not at all cordate.

4. Plant glabrous .... 34. *B. hernandioides*

4. Plant more or less densely villous with long, soft, brown hairs. 35. *B. rufipila*

3. Leaves mostly strongly inequilateral at the base, not at all peltate.

4. Capsules equally or subequally 3-winged.

5. Capsules exceeding 1 cm in length; plants with few to many long, soft, brown hairs.

6. Wings of the capsules about 2 mm wide; leaves 5 cm long or less. 36. *B. longovillosa*

6. Wings of the capsules 4 to 6 mm wide; leaves about 15 cm long. 37. *B. longiscapa*

5. Capsules about 1 cm long or less.

6. Capsules rhomboidal or subrhomboidal in outline, acute at both ends or subtruncate, the wings triangular-narrowed, acute or subacute.

7. Leaves broadly ovate to orbicular-ovate, slightly acuminate; capsules usually about 1.2 cm wide........ 38. *B. nigritarum*

7. Leaves narrowly ovate, prominently acuminate; capsules about 1.5 cm wide .... 39. *B. acuminatissima*

6. Capsules not rhomboidal in outline, retuse, rounded, or truncate at both ends, the wings not triangular-narrowed, rounded.

7. Leaves glabrous on both surfaces; capsules about 1.5 cm wide.

8. Leaves ovate, slightly acuminate, the margins subentire: petioles 2 to 4 cm long........ 40. *B. colorata*

8. Leaves narrowly ovate, prominently acuminate; petioles 8 to 18 cm long.

9. Leaves very oblique, 7 to 11 cm long.. 39. *B. acuminatissima*

9. Leaves only slightly oblique, often subequilateral, 10 to 22 cm long .... 41. *B. gitingensis*

7. Leaves pubescent on the nerves on the lower surface; capsules 10 to 12 mm wide.

8. Capsules suborbicular in outline, retuse at both ends, 8 to 10 mm long; internodes short .... 42. *B. mindorensis*

8. Capsules ellipsoid, rounded at both ends, 10 to 12 mm long; internodes long .... 43 *B. longinoda*

4. Capsules unequally 3- rarely 5-winged, one wing always much larger than the other two.

5. Larger wing distinctly concave or cucullate; sepals somewhat ciliate outside.

6. Leaves ovate, distinctly acuminate; capsule 3-winged. 44. *B. anisoptera*

6. Leaves orbicular or suborbicular, rounded or with a very short acumen; capsule 5-winged .... 45. *B. suborbiculata*

5. Wings all flat; sepals glabrous.

6. Petioles, peduncles, and leaves with scattered, fimbriate-ciliate paleae; wings of the capsules acute or subacute.

7. Capsules about 3 cm wide .... 46. *B. oxysperma*

7. Capsules about 12 mm wide .... 47. *B. calcicola*

6. Indumentum, if any, of simple hairs; wings of the capsules rounded, rarely acute.

7. Capsules about 1 cm long.

8. Whole plant glabrous or nearly so; capsules about 1.5 cm wide .... 48. *B. fenicis*

8. Leaves more or less brown-ciliate, especially on the margins; capsules about 2 cm wide .... 49. *B. copelandii*

7. Capsules exceeding 1.2 cm in length.

8. Leaves more or less hairy on both surfaces.

9. Leaves small, entire, less than 5 cm long........ 50. *B. parva*

9. Leaves medium or ample, 10 to 20 cm long, more or less toothed or shallowly lobed.

10. Leaves medium; capsules 1.4 cm wide...... 51. *B. klemmei*

10. Leaves ample; capsules larger.

11. Capsules 1.8 to 2.3 cm wide............... 52. *B. luzonensis*

11. Capsules 3 to 3.5 cm wide............ 53. *B. vanoverberghii*

8. Leaves glabrous on the upper surface.

9. Leaves entire; capsules 1 to 1.3 cm wide.. 54. *B. trichocheila*

9. Leaves more or less toothed or obscurely and shallowly lobed; capsules 1.6 to 2 cm wide........................ 55. *B. manillensis*

8. Leaves glabrous on both surfaces, entire........ 56. *B. alvarezii*

3. Leaves subequilateral, base acute, truncate, or rounded, never peltate or cordate; scandent along the trunks of trees.

4. Petioles 5 to 7 cm long; leaves truncate or rounded at the base, 2.5 to 5 cm wide .... 57. *B. gracilipes*

4. Petioles 1.5 to 2 cm long; leaves up to 9 cm in length; capsules about 1.5 cm long .... 58. *B. lagunensis*

4. Petioles, at least in the typical form, less than, 1 cm long; leaves 5 cm long or less; capsules about 1.2 cm wide .... 59. *B. aequata*

§ SPHENANTHERA.

1. **Begonia pseudo-lateralis** Warb. in Perk. Frag. Fl. Philip. (1904) 51.
Begonia salaziensis Gaudich. var. *calleryana* A. DC. Prodr 15^1 (1864) 408.
Begonia aptera Roxb var. *calleryana* F.-Vill. Noviss. App. (1880) 99.

LUZON, Province of Cagayan, Pamplona, *Bur. Sci. 7432 Ramos:* Benguet Subprovince, Sablan, *Bur. Sci. 12661 Fénix:* Province of Pampanga, Mount Abu, *Bur. Sci. 2008 Foxworthy:* Province of Laguna, Calauan, *Callery* in Herb. Mus. Paris. (type of *Begonia salaziensis* var. *calleryana* A. DC.); Province of Bataan, Lamao River, *Williams 532:* Province of Tayabas, Atimonan, *Merrill 4009.* POLILLO, *Bur. Sci. 6903 Robinson.* MINDORO, Alag River, *Merrill 991;* Mount Burburangan, *For. Bur. 8521 Merritt.* MINDANAO, Province of Surigao, *Bolster 247, Allen 159;* District of Lanao, *Mrs. Clemens s. n.* JOLO, Mount Dajo, *Merrill 5329.*

The only species of the section known from the Philippines, extending from northern Luzon to Mindanao and the Sulu Archipelago. According to Warburg it is closely allied to *Begonia heteroclinis* Miq., of northeastern Celebes.

I am indebted to Dr. F. Gagnepain of the Museum of Natural History, Paris, for a sketch of the type specimen of *Begonia salaziensis* var. *calleryana;* the specimen is fragmentary, but is unquestionably identical with Warburg's *Begonia pseudo-lateralis.*

Endemic.

§ PETERMANNIA.

2. **Begonia robinsonii** sp. nov.

Suffruticosa, erecta, circiter 80 cm alta, pauce ramosa, partibus junioribus subtus foliis ad nervos plus minus breviter brunneo-pubescentibus; foliis valde inequilateralibus, basi oblique cordatis, apice acuminatis, margine denticulatis et leviter, distanter, breviter lobatis, palmatinerviis; inflorescentiis axillaribus, quam petiolus multo brevioribus; floribus in apice pedunculorum solitariis vel paucis, bracteis bracteolisque suffultis; capsulis circiter 2 cm longis.

A suffrutescent, erect, slightly branched plant about 80 cm high. Stems terete, glabrous, not striate, 5 to 7 mm in diameter, dark-brown or nearly black when dry, the younger parts and petioles rather densely pubescent with dark-brown, short hairs. Leaves membranaceous or submembranaceous inequilaterally and obliquely oblong or oblong-ovate, 9 to 13 cm long, 4 to 7 cm wide, the base strongly obliquely cordate, the broader lobe rounded, 2 to 3 cm wide, the narrower one obtuse, less than 1 cm wide, the apex rather abruptly and slenderly acuminate, the acumen 1 to 1.5 cm long, the margins irregularly dentate, and sometimes with from one to three, ovate, acute lobes, but these lobes never more than 1 cm deep, the upper surface glabrous, dark-brown, somewhat shining, the lower much paler, the nerves brown-pubescent, the whole surface covered with numerous, small, whitish, lepidote-like spots; nerves palmately arranged, about 12, distinct, mostly forked, brown, much darker than the other parts of the lower surface; petioles pubescent, about 2 cm long; stipules oblong, 1.5 cm long or less, abruptly apiculate-acuminate, brown, membranaceous, glabrous or nearly so. Inflorescence, both staminate and pistillate, axillary, much shorter than the petioles, more or less pubescent. Staminate flowers, one to three, fasciculately arranged at the end of the short, solitary, about 4 mm long peduncle, each subtended by about two bracts similar in shape, size and texture to the stipules, and each flower subtended by a pair of smaller bracteoles; pedicels brown-pubescent, 4 mm long. Sepals 2, elliptic-ovate, rounded, 10-nerved, reticulate, in bud but nearly mature, about 8 mm long. Stamens about 25: anthers 1 mm long. Pistillate flowers unknown. Capsules obovate in outline, truncate, base acute, about 1 cm long, 1.8 cm wide, glabrous, 3-celled, the placentas bipartite, 3-winged, the wings in their upper portions about 0.7 mm wide.

LUZON, Province of Camarines, Maagnas, *Bur. Sci. 6340 Robinson*, August 28, 1908.

A species characterized by its short-peduncled, fascicled or solitary flowers, and by its comparatively large capsules.

3. **Begonia ciliifera** sp. nov.

Species B. fasciculiflorae valde affinis, differt omnibus partibus pilis brunneis longis ciliiformibus instructis, foliisque paullo minoribus.

An erect or ascending, somewhat branched, and apparently suffrutescent plant, all parts supplied with long, brown, spreading cilia-like hairs. Branches terete or angled, brown, striate, rather densely ciliate. Leaves oblong-obovate, membranaceous, shortly petioled, 6 to 11 cm long, 2 to 4 cm wide, brown or reddish-brown when dry, somewhat shining, much paler beneath, the apex rather sharply acuminate, the base gradually narrowed, somewhat inequilateral, obtuse, the margins distantly and rather coarsely toothed, the teeth acute, 4 mm long or less; the upper surface with scattered, long, brown hairs, the lower surface more densely ciliate, but here only on the nerves, and also densely covered with small, white, lepidote-like spots; petioles 3 mm long or less, densely ciliate; nerves about 5 on each side of the midrib, ascending, straight, mostly forked, the reticulations lax, distinct; stipules ciliate, brown, lanceolate, strongly acuminate, about 1 cm long. Staminate flowers axillary, solitary or in very few-flowered fascicles, similar to those of *B. fasciculiflora*, each pedicel subtended by several linear-lanceolate, acuminate, brown bracteoles.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9318 Whitford & Hutchinson*, January, 1908, in canyons, altitude about 20 m.

Both this and *Begonia fasciculiflora* are quite distinct from *B. mindanaensis* Warb., which also has axillary fascicled flowers.

4. **Begonia mindanaensis** Warb. in Perk. Frag. Fl. Philip. (1904) 55.

MINDANAO, District of Davao, Mount Dagatpan, *Warburg 14633*, type in herb. Berol.!; Todaya, *Copeland 1246*, April, 1904: Province of Surigao, *Bolster 341*, April, 1906: Butuan subprovince, *Weber 1211*, *Merrill 7310*. District of Zamboanga, Sax River, *Williams 2103*, February, 1905.

5. **Begonia fasciculiflora** sp. nov.

Suffruticosa, erecta, 0.6 ad 1.2 m alta, vix vel pauce ramosa, leviter brunneo-pubescens; foliis breviter petiolatis, inaequilateraliter oblongo-obovatis vel late oblanceolato-obovatis, acuminatis, leviter irregulariter denticulatis, vix lobatis, basi angustatis, penninerviis; floribus parvis, breviter pedicellatis, in fasciculis axillaribus dense dispositis, pedicellis bracteolis numerosis suffultis.

A suffrutescent erect plant 0.6 to 1.2 m high, not or but slightly branched, the lowermost nodes root-bearing. Stems dark-brown, terete, rather stout, about 6 mm in diameter below, longitudinally striate, pubescent with short, stout, dark-brown, more or less scattered hairs. Leaves alternate, membranaceous, inequilaterally oblong-obovate to broadly oblong-oblanceolate, 13 to 18 cm long, 5 to 7 cm wide, the apex shortly but sharply acuminate, the base narrowed, wider on one side of the midrib then on the other, the widest side narrowed to the abruptly rounded base, the other side acute, the margins distantly and irregularly, and usually doubly denticulate, scarcely lobed, the upper surface quite glabrous, the lower with scattered, short, brown hairs on the nerves, and the whole lower surface densely covered with small, whitish, sublepidote spots; petiole 5 mm long or less; midrib prominent, the lateral nerves about 7 on each side of the midrib, ascending, nearly straight, most of them forked; stipules brown, pubescent, lanceolate, prominently acuminate, 1 to 1.5 cm long. Flowers fascicled in the axils of the leaves, numerous, crowded, the pedicels about 4 mm long, each subtended by a whorl of about 5, lanceolate, acuminate, ciliate, brown bracteoles 2 to 3 mm long. Staminate flowers: Sepals 2, ovate, obtuse, about 8-nerved, just before anthesis about 6 mm long. Stamens about 30; anthers ellipsoid or oblong-ellipsoid, retuse, about 1 mm long, the filaments about as long as the anthers. Pistillate flowers not seen. Capsules glabrous, shortly peduncled or subsessile, obovate in outline, about 1 cm long, truncate, base acute, 3-celled, the placentae forked, 3-winged, the wings 2 to 3 mm wide.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9248, 9316* (type) *Whitford & Hutchinson*, December 26, 1907, and January 13, 1908, in canyons, 5 to 30 m above sea level.

A species well characterized by its dense, fascicled inflorescence, in this character approaching *Begonia fasciculata* Jack of Sumatra, but otherwise apparently not closely allied to that species.

6. **Begonia agusanensis** sp. nov.

Herba erecta, simplex vel parce ramosa, 25 ad 40 cm alta, ramulis petiolisque junioribus sparse setosis; foliis breviter petiolatis, inaequilateraliter oblongo-obovatis, in siccitate membranaceis, glabris, usque ad 13 cm longis, basi angustatis, anguste oblique cordatis, margine in partibus superioribus plus minus lobato-dentatis, apice acuminatis; petiolo 3 ad 10 mm longo; paniculis in axillis superioribus, 3 ad 5 cm longis, ramulis tenuibus; floribus masculinis parvis, sepalis 2, ovatis, petalis 2, quam sepala multo angustioribus; capsulis aequaliter 3-alatis, 10 mm longis.

An erect herb 25 to 40 cm high, simple or sparingly branched. Young stems and petioles with few, brown, setose hairs. Leaves membranaceous, glabrous, inequilaterally oblong-obovate, 5 to 13 cm long, gradually narrowed from about the middle to the narrow and obliquely cordate base, both basal lobes rounded, one much wider than the other, the margins in the upper one-half or two-thirds more or less dentate-lobed or toothed, apex acuminate; basal nerves about 7, the outer ones short, the inner ones and those leaving the midrib above the base sharply ascending; petioles 3 to 10 mm long; stipules lanceolate, acuminate, about 5 mm long. Panicles in the uppermost axils, 3 to 5 cm long, slender, dichotomously branched, the lowermost flowers female, the upper ones male, the bracts very small. Male flowers pink. Sepals 2, ovate, obtuse, about 5 mm long and 4 mm wide. Petals 2, nearly as long as the sepals but less than one-half as wide. Anthers 20 or less. Female flowers not seen. Capsules about 1 cm long, subrhomboid in outline, equally 3-winged, the wings about 5 mm wide.

MINDANAO, Butuan Subprovince, Agusan River near Waloe, on banks along small streams in forests, altitude about 50 m, *Merrill 7312* (type), October 2, 1910; Talacogon, *Weber 1209*, July, 1911.

7. **Begonia brevipes** sp. nov.

Herba erecta, parce ramosa, circiter 30 cm alta; petiolis ramis ramulisque sparse brunneo-setosis; foliis inaequilateraliter oblongis vel oblongo-ovatis, usque ad 7 cm longis, apice acuminatis, basi angustatis, acutis, vel uno latere angustatis, acutis, altero plus minus rotundatis, vix cordatis, margine plus minus lobato-dentatis denticulatisque; petiolo vix 5 mm longo; floribus masculinis parvis, sepalis 2, petalis nullis, femineis 5-meris; capsulis 12 mm longis, truncatis, aequaliter 3-alatis.

An erect slightly branched herb about 30 cm high, the petioles, branches and branchlets somewhat brown-setose. Leaves membranaceous, 5 to 7 cm long, 2 to 3.5 cm wide, inequilaterally oblong or oblong-ovate, the apex rather slenderly acuminate, the base narrowed and acute on both sides, or acute on one side and wider and rounded on the other, the margins distinctly and irregularly lobed-dentate, and more or less denticulate; nerves distinct beneath, brown, very slightly setose; petioles 2 to 4 mm long; stipules lanceolate, acuminate, about 5 mm long. Staminate and pistillate flowers in different inflorescences on the same plant, both in the uppermost axils. Staminate inflorescence 3 to 4 cm long, slightly branched, the flowers pink, their pedicels 5 to 6 mm long. Sepals 2, broadly ovate, about 5 mm long. Petals none. Stamens about 16; anthers narrowly obovoid, 1 mm long. Pistillate inflorescence 3-flowered, the peduncle 1.5 cm long, the pedicels slender, 1 to 1.5 cm long. Perianth-segments 5, narrowly obovate, 5 to 6 mm long. Styles united for the lower 1 mm, the arms about 2 mm long, each cleft near the apex, the stigmas spirally arranged. Capsules turbinate, truncate, base rounded, about 12 mm long, 1.5 mm wide, the wings equal, the upper outer corners acute; placentae 2-partite.

LUZON, Province of Cagayan, Pamplona, *Bur. Sci. 7431 Ramos*, March, 1909, in forests.

A species manifestly allied to *Begonia cumingiana* A. DC., but with smaller, more distinctly lobed leaves, and with the staminate and pistillate flowers in separate inflorescences.

8. **Begonia littleri** sp. nov.

Species B. longistipulae affinis et similis, differt foliis brevioribus, vix 8 cm longis, capsulis multo minoribus, inaequaliter 3-alatis.

An erect, herbaceous or slighty suffrutescent and slightly branched, glabrous plant 50 cm high or less, the branches terete, dark-brown. Leaves inequilateral, oblong to oblong-ovate, membranaceous, straight or slightly falcate 5 to 7 cm long, 1.5 to 3 cm wide, the base narrowed, acute, obtuse, or slightly rounded, inequilateral, not at all cordate, the apex rather sharply and slenderly acuminate, the margins, especially in the upper half, distinctly lobed-dentate, the teeth sharp, scattered, irregular; petioles 4 to 10 mm long; stipules brown, membranaceous, lanceolate, acuminate, about 1.3 cm long. Panicles in the upper axils, 5 cm long or less, the flowers apparently pistillate, the upper ones more numerous, staminate, the sepals of the staminate flowers 2, orbicular, less than 5 mm long, white, the petals none. Capsules about 1 cm long, 1.5 cm wide, truncate, the base rounded, 3-winged, one wing about 5 mm wide, the other two considerably narrower, all rounded. Placentae 2-partite.

BASILAN, Isabela, along banks of streams at an altitude of about 90 m, *DeVore & Hoover 94*, April, 1903, in flower (type), *Bur. Sci. 11512 Robinson*, June, 1910, in fruit.

A species with much the general appearance of *Begonia longistipula* Merr., but differing especially in its smaller leaves and much smaller capsules. Named in honor of Capt. C. A. Littler, of whose party Dr. Robinson was a member at the time fruiting specimens of the plant were collected.

9. **Begonia longistipula** sp. nov.

Herba erecta, ramosa, glabra; foliis lanceolatis, leviter inaequilateralibus, rectis vel leviter falcatis, membranaceis, apice longe acuminatis, basi angustatis, acutis vel obtusis, vix cordatis, margine irregulariter leviter late dentato-lobatis; stipulis lanceolatis, membranaceis, deciduis, 1.5 ad 2 cm longis; inflorescentiis masculinis terminalibus, diffusis, 6 ad 9 cm longis, floribus circiter 1 cm diametro; capsulis circiter 1.8 cm longis, aequaliter 3-alatis, apice truncatis, basi acutis.

An erect, branched, glabrous herb, the stems reddish-brown when dry. Leaves thinly membranaceous, lanceolate or narrowly oblong-lanceolate, 10 to 15 cm long, 2 to 5 cm wide, somewhat shining when dry, greenish, sometimes tinged with red or purple, straight or somewhat falcate, slightly inequilateral, the base narrowed, acute or obtuse, not cordate, the apex rather slenderly long-acuminate, the acumen denticulate, margins distantly, irregularly dentate-lobed, the lobes small, broad, acute, the base 4- to 6-plinerved, the nerves ascending, the lateral ones above the basal nerves distant, 2 or 3 on each side of the midrib, ascending; petioles rather slender, about 5 mm long; stipules brown, membranaceous, deciduous, lanceolate, 1.5 to 2 cm long, the apex ciliate-acuminate. Staminate inflorescence terminal, paniculate, rather diffuse, 6 to 9 cm long, the flowers small, pink, rather numerous, their pedicels 1 to 2 mm long. Sepals 2, ovate, obtuse or subacute, 5 mm long, faintly 7-nerved. Petals none. Stamens about 30, the anthers 1 mm long, the filaments much shorter. Bracts and bracteoles lanceolate, membranaceous, brown, acuminate, deciduous, the former about 8 mm long, the latter 1.5 mm in length. Pistillate flowers not seen, apparently axillary at the base of the staminate inflorescence. Capsules solitary, nodding, obovoid in outline, their pedicels about 1 cm long, in the upper leaf-axils and at the base of the staminate inflorescences, equally 3-winged, the apex truncate, the base acute, about 1.8 cm long and wide, the wings about 5 mm wide. Placentae 2-partite.

MINDANAO, Province of Surigao, near Surigao, *Bolster 248*, February and April, 1906, altitude about 125 m, said by the collector to be common.

A species manifestly allied to *Begonia contracta* Warb., but readily distinguished from it and other allied forms by its leaves being more or less narrowed and acute or obtuse at the base, not at all cordate.

10. **Begonia palawanensis** sp. nov.

Herba erecta, plus minus ramosa, usque ad 80 cm alta, ramulis sparse setosis; foliis breviter petiolatis, membranaceis, usque ad 14 cm longis, inaequilateraliter oblongis vel oblongo-ovatis, base abrupte angustatis, acutis vel obtusis, apice longe acuminatis, margine in parte superioribus lobato-dentatis denticulatisque; paniculis in axillis superioribus, 3 ad 5 cm longis; floribus masculinis roseis, sepalis 2, ovatis, circiter 5 mm longis; petalis nullis; capsulis 1.5 cm longis, aequaliter 3-alatis, apice truncatis, basi acutis vel subrotundatis.

An erect branched herb glabrous except for the branches which bear few, scattered, brown, setose hairs. Leaves short-petioled, membranaceous, inequilateral, oblong to oblong-ovate or oblong-obovate, 8 to 14 cm long, 3 to 6 cm wide, base narrowed from below the middle, acute or obtuse, apex prominently acuminate, margins above the middle somewhat lobed-dentate, with interspersed smaller sharp teeth, the base 3- or 5-plinerved, nerves ascending, the nerves above the basal ones 2 or 3 on each side; petioles 5 to 12 mm long; stipules membranaceous, oblong to oblong-lanceolate, 12 to 15 mm long, flagellate-acuminate. Panicles in the uppermost axils, 3 to 5 cm long, slender, the lower few flowers female, the upper more numerous, male. Male flowers pink. Sepals ovate, obtuse, about 5 mm long. Petals none. Capsule obovoid, about 15 mm long, and wide, including the 3 equal or subequal wings, apex truncate, base rounded or acute.

PALAWAN, Napsahan, on the west coast, on banks of small streams in forests about 4 m above sea level, *Merrill 7332*, September 19, 1910.

11. **Begonia leptantha** C. B. Rob. supra 211.

POLILLO, *Bur. Sci. 6857, 6944 Robinson*, August, 1909, *Bur. Sci. 10322 McGregor*, September, 1909. LUZON, Province of Tayabas, Sinaloan Trail, *Bur. Sci. 9474 Robinson*, September, 1909. Endemic.

12. **Begonia weberi** sp. nov.

Suffruticosa, erecta, simplex vel parce ramosa, usque ad 50 cm alta, omnibus partibus plus minus brunneo-ciliatis; foliis inaequilateraliter obovatis vel anguste obovatis, base angustatis oblique leviter cordatis, apice acutis, margine grosse, irregulariter sinuato-lobatis, paniculis in axillis superioribus, brevibus, paucifloris, bracteis prominentibus instructis; floribus masculinis sepalis 2, ovatis, 9 ad 10 mm longis, petalis nullis; capsulis obovatis, circiter 12 mm longis, aequaliter 3-alatis.

An erect suffrutescent plant 30 to 50 cm high, simple or sparingly branched, all parts more or less ciliate with long brown hairs, the younger parts densely so. Leaves obovate or narrowly obovate, 6 to 10 cm long, 3.5 to 6 cm wide obliquely inequilateral, narrowed to the obliquely and slightly cordate base, the broader side rounded, the other acute, apex acute, margins irregularly and coarsely sinuate-lobed, the lobes acute, the sinuses broad, shallow, both surfaces ciliate-setose, the nerves on the lower surface densely so; basal nerves about 5, the outer ones very short, the lateral nerves above the basal ones 3 or 4 on each side of the midrib, petioles 5 to 12 mm long, densely ciliate-setose with brown hairs; stipules oblong-ovate, acuminate, ciliate, about 8 mm long. Panicles narrow, few-flowered, about 3 cm long, ciliate, solitary in the upper axils, the lower one or two flowers female, the upper ones male; bracts prominent, oblong-ovate, acuminate, somewhat ciliate, membranaceous, 8 to 10 mm long, the upper ones smaller than the lower ones. Male flowers apparently pink, their pedicels slender. Sepals 2, ovate, obtuse, 9 to 10 mm long. Petals none. Stamens about 25. Capsules, including the wings, obovate, about 12 mm long, 15 mm wide, equally 3-winged, broadly acute or subtruncate at the apex, narrowed below to the somewhat rounded base, more or less ciliate with brown hairs.

MINDANAO, Butuan Subprovince, Mount Hilong-hilong, *Weber 1210*, March, 1911, rocky slopes in ravines, altitude about 450 m.

13. **Begonia loheri** sp. nov.

Erecta, parce ramosa, ramulis, petiolis, subtus foliisque ad nervos brunneo-setosis; foliis oblongis, inaequilateralibus, basin versus admodum angustatis, subsessilibus vel breviter petiolatis, 2 ad 5 cm longis, apice acuminatis, basi oblique leviter subcordatis, margine irregulariter lobatis et setoso-denticulatis; inflorescentiis in axillis superioribus, 1.5 ad 4 cm longis, angustis, paucifloris, parce ciliatis, bracteis prominentibus instructis; floribus masculinis sepalis 2, suborbicularibus, circiter 7 mm longis, basi cordatis; capsulis circiter 1 cm longis, ut videtur aequaliter 3-alatis.

An erect, somewhat branched plant about 20 cm high, the lower parts of the stems often prostrate and rooting, the branches, petioles, and leaves on the nerves on the lower surface distinctly brown-setose. Leaves oblong, 2 to 5 cm long, 0.7 to 2 cm wide, somewhat narrowed towards the inequilaterally and slightly cordate base, apex acuminate, margins irregularly lobed towards the apex, otherwise dentate and setose-denticulate: basal nerves about 6, the outer ones very short, those above the basal ones about 4 on each side of the midrib; petioles 3 mm long or less, densely brown-setose; stipules ciliate, obliquely oblong-ovate, acuminate, about 8 mm long. Panicles in the uppermost axils, solitary, narrow, few-flowered, slightly ciliate: bracts oblong-ovate, acuminate, membranaceous, about 6 mm long. Male flowers apparently pink. Sepals suborbicular, rounded, base cordate, about 7 mm long. Petals none. Stamens about 18. Capsules (every old) about 1 cm long, apparently truncate and equally 3-winged.

LUZON, Province of Rizal, Angilog, *Loher 6090, 6098*, March 15, 1906.

14. **Begonia jagori** Warb. in Perk. Frag. Fl. Philip. (1904) 54.

LUZON, without definite locality, *Jagor 889, 890*, in herb. Berol. MINDORO, Mount Halcon, *Merrill 5685* (formerly reported as *B. incisa* A. DC.); Ibalo River, *For. Bur. 12049 Merritt*; Baco River, *Merrill 1484*; south of Lake Naujan, *For. Bur. 6746 Merritt*; without definite locality, *For. Bur. 8712 Merritt*. Endemic.

Dr. I. Urban, of the Berlin Herbarium, has kindly supplied the herbarium of the Bureau of Science with a duplicate specimen of one of Jagor's numbers. *Begonia Jagori* Warb. is apparently closely allied to *B. incisa* A. DC., but the typical form is distinguished by its only toothed, not lobed leaves. The Mindoro material cited above has rather deeply lobed leaves, and some forms rather closely approach *Begonia incisa* A. DC.

Endemic.

15. **Begonia incisa** A. DC. in Ann. Sci. Nat. IV **11** (1850) 129. Prodr. **15**^{1} (1864) 321; F.-Vill. Noviss. App. (1880) 99.

LUZON, Province of Tayabas, Atimonan, *Merrill 3994*, March, 1905: Province of Zambales, *Bur. Sci. 4993 p. p. Ramos*: Province of Sorsogon, specimen ex herb. Boupland in the Berlin Herbarium, probably cotype. NEGROS, Gimagaan River, *Whitford 1582, For. Bur. 4253 Everett*, March, May, 1906.

A most characteristic endemic species, well characterized by its deeply incised leaves. The type is in the Boissier Hermarium, the collector and the definite locality, other than "Philippines," not being given: A. De Candolle surmises Née to have been the collector, and it probably was collected either by Née or by Haenke. It is known to the Visayans in Negros as *bituca* or *malangpang*.

Endemic.

16. **Begonia mearnsii** sp. nov.

Herba suberecta, omnibus partibus, praesertim junioribus, dense crispato-fulvo-villosis; foliis suborbicularibus vel subreniformibus, usque ad 10 cm longis, breviter acuminatis, leviter lobatis, basi circiter 7-nerviis, inaequilateraliter cordatis; inflorescentiis valde bracteatis; floribus masculinis longe pedicellatis, circiter 1.5 cm diametro.

An herbaceous or suffrutescent plant, suberect, or the older parts of the stems more or less decumbent and rooting at the nodes. Stems brown, more or less sulcate when dry, more or less ciliate with crisped, often matted, long, brown hairs, all younger parts of the plant densely so, the inflorescence, petioles, and fruits with similar hairs. Leaves suborbicular or subreniform, up to 10 cm long and nearly as wide, or sometimes wider than long, membranaceous, the upper surface brown, with very few, scattered, short hairs, the lower surface much paler, rather strongly brown-pubescent on the nerves, the entire lower surface densely covered with small, whitish, sublepidote spots, the base shallowly and inequilaterally cordate, the apex shortly and rather broadly acuminate, the margins irregularly and shallowly lobed, the sinuses shallow, broad, none of them exceeding 1 cm in depth; basal nerves about 7, distinct, some of them forked above; petioles 3 to 9 cm long; stipules membranaceous, oblong, about 1 cm long. Staminate and pistillate inflorescences similar, few-flowered, terminal, 5 to 12 cm long, long-peduncled, each subtended by a terminal leaf and a pair of bracts, the bracts about 1 cm long, ovate or oblong-ovate, densely brown-pubescent, the flowers crowded near the apex of the peduncle, subtended by several, more or less reniform, ciliate, pubescent, somewhat imbricate bracteoles nearly 1 cm in length. Staminate flowers: Pedicels slender, solitary, about 1.5 cm long. Sepals 2, orbicular-obovate, about 8 mm in diameter, equilateral, rounded, about 7-nerved, the back with few, scattered, stout, brown hairs on the nerves. Petals none. Stamens about 16, alternately arranged along the somewhat elongated torus, the filaments less than 1 mm long, the anthers narrowly oblong-obovoid, rounded or retuse, about 1.5 mm long. Pistillate flowers: Sepals 5, inequilaterally obovate, about 9 mm long, 7 to 8 mm wide, nerved and pubescent like those of the male flowers. Ovary densely brown-pubescent, 3-celled, 3-winged; styles 3, free or nearly so, about 3 mm long, divaricately forked. Young fruit about 8 mm long, 3-winged, pubescent.

MINDANAO, Mount Malindang, *For. Bur. 4749 Mearns & Hutchinson*, May, 1906, altitude about 1,200 m.

A species manifestly referable to the section *Petermannia*, differing from all the species of that group known to me in its dense, brown indumentum.

17. **B. leytensis** Elm. Leafl. Philip. Bot. 2 (1910) 739.

Herba erecta, parce ramosa, 20 ad 50 cm alta, parce ciliata; foliis membranaceis, oblongis, 5 ad 10 cm longis, acuminatis, inaequilateribus, basi valde oblique cordatis, vix angustatis, margine lobato-dentatis, et ciliato-denticulatis; inflorescentiis paucifloris, circiter 2 cm longis; floribus masculinis sepalis 2, oblongis vel subrotundatis, 7.5 mm longis, petalis nullis; capsulis obovatis, truncatis, base rotundatis, circiter 1 cm longis, 12 ad 15 mm latis, aequaliter 3-alatis.

LEYTE, Palo, *Elmer 7255*, January, 1906 (type number), in shaded ravines along streams at an altitude of about 230 m.
Endemic.

18. **Begonia crispipila** Elm. Leafl. Philip. Bot. 2 (1910) 737.

Suffruticosa, erecta, plus minus ramosa, ramulis parce brunneo-setosis; foliis membranaceis, oblongo-ovatis, 10 ad 20 cm longis, inaequilateralibus, basi vix angustatis, valde oblique cordatis uno latere angustis, subacutis, altero latissime rotundatis, apice acuminatis, margine distincte dentato-lobatis denticulisque, utrinque vel subtus parce setosis; inflorescentiis axillaribus, angustis, vix 3 cm longis, bracteis numerosis magnis brunneis ovatis persistentibus instructis; floribus masculinis circiter 1.5 cm diametro, sepalis 2, petalis nullis; capsulis suborbicularibus, utrinque rotundatis, circiter 13 mm longis, aequaliter 3-alatis.

LUZON, Province of Benguet, Sablan, *Elmer 6149*, April, 1904, *Bur. Sci. Fénix*, November, 1910; near Baguio, altitude about 1,500 m, *Elmer 8687*, March, 1907 (type number), *Phil. Pl. 827 Merrill*, May, 1911.
Endemic.

19. **Begonia cumingii** A. Gray Bot. Wilkes U. S. Explor. Exped. (1854) 658; Merr. in Philip. Journ. Sci. 3 (1908) Bot. 84, *pl. 3*.

Begonia philippinensis A. DC. Prodr. 16¹ (1864) 320; F.-Vill. Noviss. App. (1880) 98; Vid. Phan. Cuming. Philip. (1885) 116, Rev. Pl. Vasc. Filip. (1886) 143.

LUZON, without definite locality, *Cuming 1897*, *Lobb*, in Herb. Kew., probably both from Mount Banajao; Provinces of Laguna and Tayabas, Mount Banajao, *Wilkes Expedition*, type in U. S. National Herbarium, *For. Bur. 885 Klemme*, June, 1904, *Bur. Sci. 2419 Foxworthy*, March, 1907, *Bur. Sci. 6068 Robinson*, March, 1908: Mount Maquiling, *Merrill 6305*, February, 1909, *For. Bur. 15341 Tamesis*, November, 1909.

A very characteristic endemic species, definitely known only from the mountains of the Provinces of Laguna and Tayabas, Luzon.

As to the specific name *cumingii* it is retained in spite of the fact that A. DeCandolle coined a new name, *philippinensis*, for the species, on account of the fact that Klotzsch had at about the same time published *Petermannia cumingiana* which De Candolle transferred to *Begonia* as *B. cumingiana*. While the Vienna Code recommends that in the future the use of both the genitive and adjectival forms of the same name for two different species of the same genus be avoided, no definite ruling is made as to the treatment or validity of such names that have already been published; the inference is that both are valid.

If in the future it is definitely decided that the names *cumingii* and *cumingiana* can not be retained for the two distinct species, then the latter is the one that will need a new name, for *Begonia cumingii* A. Gray antedates by 10 years *B. cumingiana* A. DC. (as *Begonia*), although there is no doubt but that *Petermannia cumingiana* Klotzsch was published a few months earlier than *Begonia cumingii* A. Gray. The use of the name under *Petermannia*, however, has no bearing on the validity or nonvalidity of the specific name under *Begonia*.

20. **Begonia leucosticta** Warb. in Perk. Frag. Fl. Philip. (1904) 55.

LUZON, Province of Isabela, *Warburg 12004*, type in herb. Berol.: Province of Benguet, *Topping 92*, January, 1902. BUCAS (northeast of Mindanao), *Merrill 5274*, October, 1906.

Endemic.

21. **Begonia negrosensis** Elm. Leafl. Philip. Bot. 2 (1910) 736.

Suffruticosa, erecta, ramosa, subglabra, 2 ad 3 m alta, caulibus usque ad 2.5 cm crassis; foliis 10 ad 20 cm longis, ovato-oblongis, valde inaequilateralibus, basi valde oblique cordatis, apice acuminatis, margine denticulatis, subtus ad nervos parce strigosis vel ubique glabris; inflorescentiis usque ad 7 cm longis, paniculatis; floribus masculinis sepalis 2, orbicularibus, circiter 1.5 cm diametro, petalis nullis; capsulis triangulari-obovatis, 2 ad 2.3 cm longis, 3 ad 4 cm latis, apice truncatis, base acutis vel rotundatis.

NEGROS, Cuernos Mountains, *Elmer 9903* (type number), April, 1908; Canlaon Volcano, *Merrill 7024*, April, 1910, *For. Bur. 13666 Curran*, September, 1909.

Endemic.

22. **Begonia halconensis** sp. nov.

Herba erecta parce ramosa, glabra, circiter 1 m alta; foliis chartaceis vel submembranaceis, usque ad 20 cm longis, oblique oblongis vel oblongo-ovatis, valde tenuiter acute acuminatis, margine distanter dentatis et setosis, basi oblique cordatis, stipulis 1.5 ad 2 cm longis; inflorescentiis axillaribus, paucifloris, 3 ad 4 cm longis; floribus ♂ circiter 2.5 cm diametro; capsulis turbinatis, apice truncatis, basi acutis, 2 ad 2.5 cm latis, inaequaliter 3-alatis.

A stout, erect, glabrous, slightly branched herb about 1 m high, the stems near the base about 2 cm in diameter. Leaves chartaceous or submembranaceous inequilaterally oblong or ovate-oblong, 14 to 20 cm long, 6 to 8 cm wide, somewhat shining when dry, slightly paler beneath, not lobed, the apex long and slenderly sharp-acuminate, the base strongly obliquely cordate, the lower lobe very broad, rounded, the upper one much narrower, rounded to subacute, the margins distantly and irregularly dentate and with intermixed, rather soft, straight or curved, setae-like teeth, similar ones also scattered on the more prominent nerves on the lower surface; basal nerves about 7, the primary lateral ones above the base 2 or 3 on each side of the midrib; petioles

2.5 to 4 cm long; stipules oblong-lanceolate, membranaceous, brown, 1.5 to 2 cm long, oblong-lanceolate, the apex prominently setose acuminate. Inflorescence axillary, few-flowered, 3 to 4 cm long, the staminate and pistillate flowers white, apparently in different inflorescences on the same plant, the peduncles less than 1 cm long. Staminate flowers: Pedicels slender, 1.5 cm long. Sepals 2, elliptic-ovate, about 12 mm long, 10 mm wide. Petals similar but smaller, about 10 mm long and 7 mm wide. Stamens about 60; anthers oblong or narrowly oblong-obovoid, 2.5 mm long; filaments somewhat shorter. Pistillate flowers: Bracteoles narrowly lanceolate, somewhat boat-shaped, about 1 cm long. Sepals 2, obovate, rounded, 12 mm long, 10 mm wide, the petals apparently 2, similar. Styles 3.5 mm long, free nearly to the base, the stigmas spiral. Capsule inequally 3-winged, turbinate, the apex truncate, the base acute or obtuse, 1.5 cm long, 2 to 2.5 cm wide, one wing nearly 1 cm wide, the other two one-half as wide.

MINDORO, Mount Halcon, on steep, damp, forested slopes at an altitude 1,100 to 1,800 m, *Merrill 5515* (type), *5607*, November, 1906.

23. **Begonia merrittii** Merr. in Philip. Journ. Sci. 5 (1910) Bot. 365.

LUZON, Bontoc Subprovince, *Vanoverbergh 513*, *514*: Lepanto Subprovince, Mount Malaya, *For. Bur. 14491 Darling*, January, 1909: Benguet Subprovince, Suyoc to Pauai, *Merrill 4781*, November, 1905; Pauai, *Bur. Sci. 4385 Mearns*, *Bur. Sci. 8496 McGregor*: Mount Pulog, *For. Bur. 16176 Curran, Merritt, & Zschokke*, January, 1909, *Merrill 5602*, May 1909: Mount Tonglon (Santo Tomás), *Phil. Pl. 711*, *858 Merrill*, May, 1911, *For. Bur. 4996 Curran*, August, 1906, *Elmer 6254*, May 1904, *For. Bur. 11107 Whitford*, April, 1908, *Williams 1211*, *1532*, November, 1904, *Bur. Sci. 5455 Ramos*, December, 1908, *Mearns s. n.*, December, 1906, *Merrill 4823*, November, 1905; Mount Ugo, *Bur. Sci. 5839 Ramos*; Mount Lusod, *For. Bur. 15736 Merritt & Curran*, December, 1908.

An endemic species characteristic of the mossy forests of the Mountain Province, Luzon, abundant on most high peaks and ridges above an altitude of 1,000 m. Igorot (Bontoc) *gitgitlang*.

24. **Begonia contracta** Warb. in Perk. Frag. Fl. Philip. (1904) 54.

The type of this species was from Sampaloc, Province of Tayabas, Luzon, *Warburg 13085*, in herb. Berol. I am disposed to refer to the species the following specimens although nearly all of them differ from *B. contracta*, as described, in some minor characters:

LUZON, Province of Isabela, San Luis, *Bur. Sci. 8008 Ramos*, May, 1909, the capsules larger than in the type (1.5 cm long), and with much longer pedicels (nearly 1 cm in length), the leaves purple when dry: Province of Rizal, Bosoboso, *Bur. Sci. 2621 Ramos*, May, 1907, leaves more lobed than in the type and somewhat denticulate: Province of Tayabas, *For. Bur. 6716 Kobbe*, with lax, elongated panicles, and purple, denticulate leaves: Province of Bataan, Mount Mariveles, *Copeland 2042*. May, 1906, altitude about 800 m. NEGROS, Gimagaan River. *Whitford 1607*, *1648*, *1588*, *1504*; Kinaruyan River, *For. Bur. 7295 Everett*. MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9319*, *9273 Whitford & Hutchinson*.

As above interpreted the species is a variable one, and additional material, in

conjunction with careful field observations, may lead to a different disposition of some of the specimens cited.

25. **Begonia quercifolia** A. DC. in Ann. Sci. Nat. IV 11 (1859) 129, Prodr. 15[1] (1864) 320; F.-Vill. Nov. App. (1880) 99: Vid. Phan. Cuming. Philip. (1885) 116, Rev. Pl. Vasc. Filip. (1886) 143.

SAMAR, *Cuming 1696* in herb. Kew.

I am disposed to refer to this species the following specimens, although most of them have somewhat larger leaves than has the type:

LUZON, Province of Tayabas, Kabibihan, *Bur. Sci. 13237 Ramos;* Anoling River, *Bur. Sci. 9326 Robinson,* August, 1909. MINDORO, Baco River, *McGregor 310.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 344,* leaves purple when dry.

26. **Begonia bolsteri** sp. nov.

Herba glabra, caulibus inferne prostratis vel subprostratis, radicantibus superne suberectis, circiter 20 cm altis, vix ramosis; foliis membranaceis, usque ad 12 cm longis, oblique oblongo-ovatis, basi valde inaequilateraliter cordatis, apice longe acuminatis, margine denticulatis, vix lobatis; inflorescentiis axillaribus, pedunculatis, floribus inferioribus femineis, superioribus masculinis, his sepalis 2, petalis nullis; capsulis aequaliter 3-alatis, circiter 1.2 cm longis, utrinque retusis vel subtruncatis.

A glabrous herb, the stems unbranched, prostrate or subprostrate below and rooting at the nodes, the ends erect or suberect, 20 cm higher or less, the internodes elongated. Leaves membranaceous, oblong-ovate or narrowly ovate, 6 to 12 cm long, 3 to 6 cm wide, very strongly and obliquely inequilateral, the base prominently cordate, both lobes rounded, the apex rather slenderly long-acuminate, the margins denticulate or ciliate-denticulate, not lobed, but sometimes slightly repand; basal nerves 7 or 8; petioles 2 to 4 cm long; stipules brown, membranaceous, acuminate, oblong-ovate, about 8 mm long. Inflorescence axillary, solitary, the peduncles about 4 cm long, the lower flowers pistillate, the upper ones staminate. Staminate flowers pink. Sepals 2, orbicular-reniform, 5 to 6 mm in diameter, the pedicels slender, 4 to 5 mm long. Petals none. Stamens 15 to 25, the filaments 1 to 1.5 mm long; anthers narrowly obovoid, truncate or obtuse, about 1 mm long. Bracteoles ovate, about 3 mm long, frequently wider than long, deciduous. Pistillate flowers with pedicels 5 to 8 mm long, the bracts broadly ovate, 3 to 3.5 mm long, the lobes 4, the two outer ones slightly exceeding the inner ones, broadly ovate, obtuse, 5 to 6 mm long. Styles 3, nearly free, about 4 mm long, forked above, the stigmas spiral. Capsules 10 to 12 mm long, about 1.5 cm wide, the apex truncate or somewhat retuse, the base rounded, equally 3-winged, the wings broadly rounded, 4 to 6 mm wide. Placentas 2-partite.

MINDANAO, Province of Surigao, *Bolster 310,* April, 1906, said by the collector to be common in damp shaded places at an altitude of about 75 m.

27. **Begonia ramosii** sp. nov.

Herba erecta, succulenta, glabra, 20 ad 50 cm alta, pauce ramosa; foliis membranaceis, oblongo-ovatis valde inaequilateralibus, basi non angustatis, valde oblique cordatis, apice acuminatis, margine distanter irregulariter dentatis, haud lobatis; inflorescentiis axillaribus, brevibus, congestis, angustis, 2 ad 4 cm longis; floribus masculinis numerosis, sepalis 2, suborbicularibus, petalis nullis; capsulis obovatis, 1.3 ad 1.5 cm longis, truncatis, base acutis, aequaliter 3-alatis.

An erect, glabrous, succulent, sparingly branched herb 20 to 50 cm high, the lower parts of the stems prostrate or ascending, often rooting. Leaves when dry membranaceous, oblong-ovate, obliquely inequilateral, 12 to 18 cm long, 4 to 7.5 cm wide, base obliquely and prominently cordate, both lobes rounded, one much narrower than the other, apex prominently acuminate, margins irregularly and rather distantly dentate, not lobed; basal nerves 7, the outer ones short the lateral nerves above the base usually about 3 on each side of the midrib; petioles 4 to 8 cm long; stipules caducous, membranaceous, 1 to 1.5 cm long. Panicles in the upper axils, narrow, congested, 4 cm long or less. Male flowers pink, several on each of the very short lateral branches of the panicle, the bracts 10 to 15 mm long. Sepals 2, suborbicular or orbicular-obovate, about 7 mm long. Petals none. Stamens about 20. Female flowers: Perianth-lobes 4, subequal, oblong, obtuse, 9 to 10 mm long. Styles 3, forked; stigmas twisted. Capsules obovate, 1.3 to 1.5 cm long, about 2 cm wide, truncate or subtruncate, base narrowed, rounded or subacute, equally 3-winged.

LUZON, Province of Laguna, San Antonio, in forests, *Bur. Sci. 10941, 10942* (type) *12047 Ramos*, August, 1910.

28. **Begonia cumingiana** (Kotzsch) C. DC. Prodr. 15^{1} (1864) 320; F.-Vill. Noviss. App. (1880) 98; Vid. Phan. Cuming. Philip. (1885) 116, Rev. Pl. Vasc. Filip. (1886) 143.

Petermannia cumingiana Klotzsch in Monatsb. Berl. Akad. (1854) 124, Abh. Akad. Berl. (1855) 75, *t. 6, f. C.*

Diploclinium cumingianum Miq. Fl. Ind. Bat. 1^{1} (1857) 691.

LUZON, Province of Albay, *Cuming 856* in herb. Kew.: Province of Albay, *For. Bur. 12260 Curran*, June, 1908.

The specimen collected by Mr. Curran agrees closely with the description and with sketches made by myself from Cuming's plant in the Kew Herbarium. It is well characterized by its short petioles.

Endemic.

29. **Begonia rizalensis** sp. nov.

Herba erecta, ramosa, subtus foliis ramulis petiolisque breviter brunneo-strigosis; foliis oblongis valde inaequilateralibus, basi vix angustatis, oblique cordatis, altero latere late rotundatis, altero angustis, acutis, apice acuminatis, margine distanter irregulariter dentatis; petiolo ad 10 mm longo; floribus paniculatis, masculinis sepalis 2, reniformi-orbicu-

laribus, basi cordatis, circiter 9 mm latis, petalis nullis; capsulis late ellipticis utrinque subaequaliter rotundatis vel subtruncatis, aequaliter 3-alatis, 1.3 ad 1.8 cm longis, 1.5 ad 2 cm latis.

An erect branched herb, the branches, petioles and lower surfaces of the leaves brown-strigose with rather stout, short hairs. Leaves oblong, coriaceous when dry, 8 to 12 cm long, 2 to 4.5 cm wide, strongly inequilateral, base obliquely cordate, one side broad, rounded, the other acute, apex slenderly acuminate, margins distantly and irregularly dentate or subentire; basal nerves about 7, the outer ones very short, the lateral ones above the base 3 or 4 on each side of the midrib, beneath densely brown-strigose; petioles 5 to 10 mm long, densely strigose; stipules membranaceous, lanceolate, acuminate, about 1.5 cm long, caducous. Panicles terminal, open, few-flowered, about 5 cm long, short-peduncled, glabrous. Male flowers red or pink. Sepals 2, suborbicular-reniform, rounded, base cordate, about 9 mm wide. Petals none. Stamens about 40, the anthers small. Female flowers red or pink, long-pedicelled. Perianth-segments 4, subequal, ovate, about 9 mm long. Styles 3, forked; sigmas spirally twisted. Capsules broadly elliptic, subequally rounded or subtruncate at both ends, equally 3-winged, 1.3 to 1.8 cm long, 1.5 to 2 cm wide.

LUZON, Province of Rizal, San Isidro, *Bur. Sci. 12109 Ramos*, June, 1910 (type); Montalban, *Loher 6083*, April, 1905.

A species well characterized by its brown-strigose branches, petioles, and lower surfaces of its leaves.

30. **Begonia esculenta** sp. nov.

Erecta, ramosa, herbacea vel suffruticosa; foliis oblongo-ovatis, valde inaequilateralibus, apice longe tenuiter acuminatis, basi haud cordatis, uno latere late rotundatis altero multo angustioribus, acutis; subtus, praesertim ad nervos, minutissime pauce brunneo-furfuraceis; paniculis masculinis terminalibus, amplis, diffusis, usque ad 11 cm longis, floribus miniatis, usque ad 2.3 cm diametro.

An erect, branched, herbaceous or suffrutescent plant less than 1 m high, glabrous except the very slightly and minutely brown-furfuraceous lower surfaces of the leaves. Branches terete, rather slender, brownish, smooth or somewhat striate when dry. Leaves oblong-ovate, chartaceous or subcoriaceous, 8 to 14 cm long, 2.5 to 3.5 cm wide, slightly shining or dull when dry, glabrous on the upper surface, beneath paler and with scattered, minute, brown, furfuraceous hairs or scales, especially on the nerves, the apex slenderly and acutely long-acuminate, the base broad and rounded on one side of the midrib, much narrower and acute on the other, not at all cordate, the margins distantly and irregularly sharply denticulate, not at all lobed, or on the narrower side subentire; basal nerves usually 7, two or three additional ones on each side of the midrib above the base; petioles 1 to 1.8 cm long. Pistillate flowers not seen. Staminate panicles terminal, ample, dichotomously branched, about 11 cm long, diffuse, rather many-flowered, the pedicels slender, 5 to 7 mm long, the bracts small, lanceolate, acuminate, about 2 mm long, deciduous. Staminate flowers vermillion, about 2.4 cm in diameter. Sepals 2, broadly ovate, or orbicular-ovate, rounded, about 12 mm long. Stamens about 30; anthers narrowly obovoid, obtuse, about 1.2 mm long, the filaments somewhat longer. Capsules not known.

LUZON, Province of Tayabas, Infanta, Mount Binuang, *Bur. Sci. 9449* **Robinson**, August, 1909, in forests at an altitude of about 800 m.

This species is characterized by its rather large, vermillion staminate flowers that are arranged in diffuse, terminal, panicles, and by its leaves being nearly entire, denticulate but not lobed or dentate-lobed, and rounded, not cordate at the inequilateral base. It is manifestly allied to *Begonia merrittii*, *B. malindangensis*, and related forms. The leaves, stems, and flowers like most of our species, have a pleasant acid taste, and are eaten by the Tagalogs and by the Negritos as a relish with fish.

31. **Begonia subtruncata** sp. nov.

Suffruticosa, erecta, ramosa, glabra; foliis oblongis, subfalcatis, in siccitate chartaceis, subtus pallidis, basi non angustatis, oblique truncato-rotundatis, non cordatis, altero latere late rotundatis, altero angustis, acutis, breviter petiolatis, margine dentatis vel subdentato-lobatis, apice acuminatis; inflorescentiis paucifloris, floribus masculinis ignotis; capsulis 2 cm longis, 3 cm latis, aequaliter 3-alatis, apice late truncatis, basi acutis.

An erect, branched, glabrous, suffrutescent plant exceeding 0.5 m in height. Leaves oblong, often subfalcate, strongly inequilateral, base not narrowed, very oblique, rounded-subtruncate, not cordate, one side very broad, rounded, the other very narrow, acute, chartaceous and rather pale on the lower surface when dry, 7 to 15 cm long, 2 to 5 cm wide, dentate or subdentate-lobed, apex acuminate; basal nerves 7 or 8, the outermost ones not prominent; petioles 7 to 12 mm long; stipules lanceolate, caducous, about 1 cm long. Inflorescence in the uppermost axils, few flowered. Male flowers not seen. Female flowers: Perianth segments ovate, about 7 mm long; styles 3, short, forked, the stigmas spirally twisted; bracts 2, at the base of each flower, membranaceous, ovate, about 8 mm long. Capsules 2 cm long, 3 cm wide across the truncate apex, equally 3-winged, narrowed to the acute base.

LUZON, Province of Union, Castilla, *Lober 6076*, March, 1906.

Probably allied to *Begonia merrittii* Merr., but differing in several characters, notably in its leaves not being at all cordate. It is distinguished from *Begonia cumingii* A. Gray, by its leaves being quite glabrous.

32. **Begonia everettii** sp. nov.

Suffruticosa, erecta, glabra; foliis membranaceis, inaequilateraliter oblongo-ovatis, basi valde oblique truncatis, vix vel obscurissime cordatis, altero latere angustis, acutis, altero latissime rotundatis, apice subcaudato-acuminatis, margine distanter repando-dentatis denticulatisque; paniculis in axillis superioribus, diffusis, usque ad 8 cm. longis, floribus inferioribus femineis, superioribus masculinis; floribus masculinis sepalis 2, 5 ad 6 mm longis, petalis nullis; capsulis aequaliter 3-alatis, 1.6 ad 1.8 cm longis, apice truncatis, basi rotundatis.

An erect, apparently suffrutescent, branched, glabrous plant, the ultimate branchlets brownish or grayish, terete. Leaves oblongo-ovate to broadly oblong, membranaceous, 11 to 16 cm long, 3.5 to 6.5 cm wide, slightly shining when dry, paler beneath, the nerves on the lower surface brownish-purple, the base strongly obliquely truncate, or very obscurely cordate, one side much narrower than the other, acute, the other side very broad, rounded, the apex slenderly long-acuminate, denticulate, the margins with distant, pointed teeth, somewhat repand between the teeth and denticulate, the larger teeth opposite the ends of the nerves and their larger branches; basal nerves 7 to 9, mostly distinct, forked; petioles 1.5 to 4 cm long; stipules oblong-lanceolate, acuminate, membranaceous, about 2 cm long. Panicles in the upper axils, up to 8 cm in length, rather diffuse, the branches slender, the pedicels 8 mm long or less, the bracts membranaceous, similar to the stipules but somewhat smaller, the bracteoles much reduced, deciduous. Staminate flowers numerous. in the upper part of each panicle, pink or red. Sepals 2, orbicular-ovate, rounded, 5 to 6 mm in diameter. Petals none. Stamens about 20; anthers obovate-ellipsoid, 1 mm long, the filaments shorter than the anthers. Pistillate flowers one or two at the base of each inflorescence, their pedicels about 2 cm long; lobes 5, oblong, 7 to 9 mm long, 2.5 to 3.5 mm wide, reticulate. Capsules equally 3-winged, 1.6 to 1.8 cm long, 1.6 to 2 cm wide, apex truncate, base rounded, the wings reticulate; placentae 2-partite.

NEGROS, Sicaba, Daluapan River, *For. Bur. 5587 Everett* (type), November 12, 1906, locally known to the Visayans as *aslom*. LUZON, Province of Tayabas, *For. Bur. 6717 Kobbe*.

A species probably as closely allied to *Begonia contracta* Warb., as to any other known form, but well distinguished by its larger capsules, and differently shaped leaves, the base being obliquely truncate but scarcely cordate.

33. **Begonia malindangensis** sp. nov.

Species B. merrittii Merr. similis, et ut videtur valde affinis, differt foliis paullo majoribus, minus lobatis, basi haud cordatis uno latere acutis altero rotundatis, floribus masculinis minoribus, 2 ad 2.4 cm diametro.

Erect, herbaceous or suffrutescent, much branched, 0.7 to 1.3 m. high, glabrous throughout. Branches terete, brownish, rather slender, somewhat striate when dry. Leaves oblong-ovate to oblong-lanceolate, chartaceous, brown or olivaceous when dry, paler beneath, somewhat shining when dry, entirely glabrous, 9 to 13 cm long, 2 to 4.5 cm wide, strongly inequilateral, apex slenderly long-acuminate, base broad and rounded on one side, narrow and acute on the other, not at all cordate, the margins distantly and irregularly sharply dentate or denticulate, scarcely lobed; basal nerves 5 or 6, the lateral ones above the basal nerves two or three on each side of the midrib; petioles 5 to 16 mm long; stipules lanceolate, acuminate, membranaceous, brown, 1 to 1.5 cm long, deciduous. Panicles axillary and terminal, rather few-flowered, mostly about 5 cm long, the staminate and pistillate flowers apparently in different inflorescences. Staminate flowers pink to nearly white, about 2.4 cm in diameter. Sepals 2, orbicular-ovate, rounded, about 12 mm in diameter, with about 13 faint, slender nerves. Petals none. Stamens about 30; filaments 1 to 2 mm long; anthers narrowly obovoid, 1 to 1.2 mm long. Pistillate flowers few, usually two on each branchlet, each subtended by a pair of thin, membranaceous, deciduous, brown, boat-shaped bracteoles which are about 13 mm long, and, when spread, about 5 mm wide; pedicels slender, glabrous, about 1 cm long. Lobes 5, ovate or narrowly ovate, acuminate, reticulate, about 1 cm long. Capsules turbinate, the apex truncate, the base acute or rounded, about 2 cm wide, 1.3 cm long, equally 3-winged, the wings reticulate, rounded at the outer upper corner. Placentae 2-partite.

MINDANAO, Province of Misamis, Mount Malindang, in forests at an altitude of about 1,800 m, *For. Bur. 4563 Mearns & Hutchinson* (type), May, 1906; District of Davao, Todaya, *Copeland 1284*, April, 1904.

§ DIPLOCLINIUM.

34. **Begonia hernandioides** sp. nov.

Herba subglabra, caulibus stipulis brunneis ovatis acuminatis circiter 1.5 cm longis obtectis; foliis longe petiolatis leviter inaequaliter suborbicularibus vel orbiculari-ovatis, peltatis, basi late rotundatis, apice acuminatis; inflorescentiis foliis subaequilongis; floribus roseis, circiter 1.5 cm diametro; capsulis inaequaliter 3-alatis.

Stem creeping, rooting, covered with numerous, large, brown, ovate or oblong-ovate, membranaceous, glabrous, or very slightly ciliate stipules 1.5 to 2 cm long, about 1.2 cm wide. Petioles 7 to 18 cm long, glabrous. Leaves peltate, slightly inequilateral, suborbicular or orbicular-ovate, 7 to 9 cm in diameter, membranaceous, glabrous, shining, radiately about 9-nerved, the base broad, rounded, the apex somewhat lateral, acuminate, margins entire or nearly so, the petiole attached at 1.5 to 2 cm from the basal margin. Peduncles glabrous, 10 to 25 cm long, dichotomously branched above, the inflorescence at most 6 cm wide, comparatively few-flowered. Staminate flowers about 1.5 cm in diameter, pink. Sepals 3, orbicular to orbicular-ovate, rounded. Petals 2, narrowly obovate, 7 mm long, 3.5 mm wide, obtuse. Stamens about 30; filaments 1 to 1.5 mm long; anthers obovate, blunt, 1 mm long. Capsules about 1 cm long, 1.5 cm wide, the apex truncate, the base subtruncate or broadly rounded, unequally 3-winged, one wing nearly 1 cm wide, obtuse or subacute, the other two wings rounded, less than 5 mm wide, all reticulate. Placentae 2-partite. Pedicels in fruit about 1.5 cm long.

LUZON, Province of Cagayan, Claveria, *Bur. Sci. 7393* (type), *7387 Ramos*, March, 1909, on rocks along streams.

A strongly marked species, well characterized by its broadly peltate, glabrous, suborbicular-ovate, entire leaves.

35. **Begonia rufipila** sp. nov.

Species B. hernandioidei valde affinis, differt omnibus partibus, praesertim junioribus, plus minus dense molliter rufo-villosis.

An herbaceous plant, the rootstock creeping. Stipules linear or linear-lanceolate, about 1 cm long, acuminate, densely brown-villous. Leaves ovate or suborbicular-ovate, peltate, entire, base broad, apex somewhat lateral, acuminate, membranaceous, 6 to 9 cm long, 4 to 6 cm wide, the lower surface with numerous, long, soft, brown hairs, the upper surface ultimately nearly glabrous, radiately about 9-nerved; petioles 5 to 8 cm long, densely villous with long, soft, brown hairs, inserted at about 1.5 cm from the basal margin of the leaf-blade. Inflorescence about as long as the leaves, dichotomously branched above, ultimately nearly glabrous. Flowers unknown. Capsules about 12 mm long, 15 mm wide, the base acute, the apex truncate, unequally 3-winged, the wings reticulate, one about 6 mm wide, the other two about one-half as wide.

LUZON, Province of Ilocos Sur, Dolores, *For. Bur. 5665 Klemme*, October 31, 1906, on moist boulders in shaded places.

A species similar to and manifestly very closely allied to *Begonia hernandioides* Merr., differing manifestly in its rather dense, brown indumentum which is composed of long, soft, hairs.

36. **Begonia longovillosa** A. DC. in Ann. Sci. Nat. IV 11 (1859) 130, Prodr. 15¹ (1864) 324; F.-Vill. Noviss. App. (1880) 98.

"In Philippinis ad Manillam (Hügel! 4170 in h. Vindob.)" ex A. DeCandolle l. c.

Among the numerous specimens of this genus in our herbarium I have found none that agree at all well with the description of the above species. It seems to be well characterized by its capsules which are described as 6 lines long, 4 lines wide, with equal wings a line in width.

37. **Begonia longiscapa** Warb. in Perk. Frag. Fl. Philip. (1904) 52.

LEYTE, *Jagor s. n.*, 1861, type in herb. Berol.!

This species does not appear to be matched in any of the recent collections. Endemic.

38. **Begonia nigritarum** Steud. Nom. (1821) 104, ed. 2, 1 (1840) 194; A. DC. Prodr. 15¹ (1864) 401; F.-Vill. Noviss. App. (1880) 99.

Begonia capensis Blanco Fl. Filip. ed. 1 (1837) 724, ed. 2 (1845) 501, Naves l. c. ed. 3, *pl. 413*, non Linn. f.

Begonia rhombicarpa A. DC. in Ann. Sci. Nat. IV. 11 (1859) 129; Prodr. 15¹ (1864) 323; F.-Vill. Noviss. App. (1880) 98; Vid. Phan. Cuming. Philip. (1885) 116, Rev. Pl. Vasc. Filip. (1886) 143; Perk. Frag. Fl. Philip. (1904) 53; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 100.

Begonia merrillii Warb. in Perk. Frag. Fl. Philip. (1904) 53.

This variable species is the most common and widely distributed one in the Philippines, occurring at low and medium altitudes, and as here interpreted, is represented by the numerous specimens cited below. Various forms are represented, but these are apparently largely due to habitat, although future careful field work may lead to a somewhat different disposition of some of the specimens. From an examination of dried material only, I have been unable to find characters by which any of the forms can constantly be distinguished, that is, characters that I consider worthy of being taken into consideration as a basis of specific or even varietal distinctions.

Form A, with small to medium leaves, mostly less than 5 cm long, and with short stems which are more or less densely covered with brown stipules:

LUZON, Province of Laguna, Calauan, *Cuming 510* (cotype): Province of Bataan, Lamao River, *Whitford 204, 499, Merrill 3124, Williams 33, 250; Limay, Bur. Sci. 6183 Robinson.*

Form B, with medium to large leaves, mostly 6 to 11 cm long, and short stout stems covered with stipules:

LUZON, Province of Nueva Vizcaya, Cordon, *Merrill 143* (cotype of *B. merrillii* Warb.): Province of Bataan, Lamao River, *Whitford 500, 1297, Borden 753, Elmer 6680 For. Bur. 13553 Alvarez:* Province of Rizal, Tanay, *Merrill 2348;* Bosoboso, *For. Bur. 3308 Ahern's collector;* Antipolo, *Bur. Sci. 12105, 12586 Ramos:* Province of Tayabas, Atimonan, *Gregory 141:* Province of Albay, *Bur. Sci. 2919 Mearns.* MINDORO, Puerto Galera, *Merrill 3324*, October, 1903: Mount Malasumba, *For. Bur. 8629 Merritt;* Bulalacao, *Bur. Sci. 1527 Bermejos.* MINDANAO, District of Cotabato, *Bur. Sci. 11719 Robinson.*

Form C, with small leaves, and slender, extended, stems, not covered with stipules:

LUZON, Province of Bataan, Mount Mariveles, *Merrill 3862, Whitford 1345*, August, 1904, and September, 1905, altitude about 1,000 m.

This form grows on cliffs on exposed forested ridges, and its extended stems is probably due to its habitat.

Form D, with medium or large leaves and extended stems not covered with stipules:

LUZON, Province of Bataan, Lamao River, *Whitford 492*, July, 1904, *Bur. Sci. 1584 Foxworthy:* Province of Laguna, Los Baños, *Bur. Sci. 9912 Robinson:* Province of Cavite, Mendez Nuñez, *Bur. Sci. 1286 Mangubat*, August. 1906: Province of Isabela, *Bur. Sci. 8029 Ramos:* Province of Cagayan, Caua Volcano, *Clark*, August, 1908. LEYTE, Palo, *Elmer 7115*, January, 1906. MINDANAO, Province of Surigao, *Allen 161, Bolster 302:* Butuan Subprovince, *Weber 1898.* PALAWAN, Malampaya Bay, *Merrill 7245.*

This form corresponds to form B in its leaves, but differs in its slender, extended stems which are not covered with stipules, the internodes varying from 1 to 5 cm in length.

As to the name of the species, judging from Kamel's description of "*Acetosa nigritarum*", on which Steudel based the name *Begonia nigritarum*, I am of the opinion that there can be no doubt but that Kamel's plant was quite the same as the species usually known as *Begonia rhombicarpa* A. DC., and, in fact, F.-Villar makes the same suggestion. The plant is common and widely distributed at low altitudes in the Philippines, growing in the habitat ascribed by Kamel to his *Acetosa nigritarum*. Dryander,[9] who examined Kamel's drawing preserved in the British Museum, considered it to be allied to *Begonia malabarica*. Steudel's name, I believe, constitutes a valid publication, and being the earliest one for the species is here adopted.

I have been unable to find any good characters by which *Begonia merrillii* Warb. can be distinguished from the above species; cotypes of both *B. merrillii* Warb., and *B. rhombicarpa* A. DC. are in the Herbarium of the Bureau of Science, and although the specimens are not quite identical, the differences are, I consider, too slight to warrant the separation of the two as distinct species.

Begonia rhombicarpa A. DC. var. *lobbii* A. DC. l. c., is distinguished from the typical form of the species by its slightly larger flowers, but working from the description alone, I have been unable definitely to refer any of the above specimens to it with certainty; the variety is undoubtedly included in my conception of the species *Begonia nigritarum* Steud.

Widely known as *pingol bato* and as *lingat*.

Endemic.

39. **Begonia acuminatissima** sp. nov.

Herba subglabra, foliis longe petiolatis, usque ad 11 cm longis, oblique oblongo-ovatis vel anguste ovatis, basi inaequilateraliter cordatis, apice sensim angustatis, longe acute acuminatis, margine leviter irregulariter lobatis; floribus 1.5 cm diametro, bracteolis parvis, ovatis; capsulis subaequaliter 3-alatis, 8 ad 10 mm longis, basi leviter retusis, apice acutis vel obtusis, alis plus minus angustatis, subacutis vel obtusis, 5 ad 6 mm latis.

A subglabrous herb, the stems prostrate, creeping, glabrous or nearly so, the stipules brown, oblong-ovate, acuminate, less than 1 cm long. Leaves obliquely oblong-ovate or narrowly ovate, membranaceous, 7 to 11 cm long, 3 to 6 cm wide, glabrous, or the nerves beneath, in young leaves, slightly hairy, the base inequilaterally cordate, the lobes rounded, the sinus shallow, acute, the apex gradually narrowed and rather long and sharply acuminate, the margins with several to many small, irregular, broadly triangular, acute lobes, none of the lobes, exceeding 1 cm in length, and all broader than long, the base palmately 7- or 8-nerved; petioles 8 to 18 cm long, at first with few, scattered, brown hairs, ultimately nearly glabrous. Inflorescence about as long as the leaves, dichotomously branched above. Flowers pink and white, the staminate ones 1.5 cm in diameter. Sepals 2, broadly elliptic, rounded, 7.5 mm long, 6 mm wide, with about 8 faint nerves. Petals 2, narrowly obovate, 6 mm long, 4 mm wide, the apex broad, rounded, base narrowed, faintly 5- or 6-nerved. Stamens about 35; anthers 1 mm long, truncate; filaments 0.5 to 1 mm long. Bracteoles broadly ovate, 1.5 mm long and wide, obscurely blunt-acuminate. Capsules 8 to 10 mm long, 15 mm wide, the base somewhat retuse, the apex acute or blunt, the wings subequal, 5 to 6 mm wide, somewhat narrowed and subacute or blunt, rarely rounded. Placentae 2-partite.

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[9] Trans. Linn. Soc. 1 (1791) 171.

BALUT ISLAND, *Merrill 5419*, October 8, 1906, on rocks along streams in shaded ravines, altitude about 400 m. MINDANAO, Butuan Subprovince, Agusan River near Waloe, *Merrill 7306*.

A species manifestly allied to *Begonia rhombicarpa* A. DC., but with quite differently shaped leaves. It is probably also closely allied to *B. colorata* Warb., but differs from that species in its leaves and capsules.

40. **Begonia colorata** Warb. in Perk. Frag. Fl. Philip. (1904) 51.

MINDANAO, District of Davao, Sibulan, *Warburg 14633*, July, 1888, type in herb. Berol.!

This species is possibly represented by *Copeland 803*, from a rocky bluff near Davao, Mindanao, April 2, 1904.

Endemic.

41. **Begonia gitingensis** Elm. Leafl. Philip. Bot. 2 (1910) 738.

Herba succulenta; foliis longe petiolatis, in siccitate chartaceis, oblongo-ovatis, leviter inaequilateralibus, basi cordatis, vix vel obscure obliquis, supra angustatis, acuminatis, usque ad 22 cm longis, margine subintegris vel leviter irregulariter dentatis; stipulis lanceolatis, acuminatis, 1.5 cm longis; inflorescentiis foliis aequalibus vel longioribus, longe pedunculatis, paniculatis; floribus masculinis sepalis 2, oblongo-ellipticis, 5 mm longis; petalis 2, quam sepala multo angustioribus; capsulis subrhomboideis, 7 mm longis, 12 ad 15 mm latis, subaequaliter 3-alatis.

SIBUYAN, Mount Giting-giting, *Elmer 12368*, April, 1910 (type number), altitude about 530 m.

Endemic.

42. **Begonia mindorensis** sp. nov.

Herba parce brunneo-ciliatis; foliis oblique ovatis, membranaceis, usque ad 16 cm longis, basi subaequilateraliter cordatis, lobis rotundatis, haud superpositis, apice distincte acuminatis, margine leviter irregulariter undulato-lobatis, subtus ad nervos petiolisque brunneo-ciliatis; stipulis oblongo-ovatis, acuminatis, plus minus ciliatis, circiter 1 cm longis; pedunculis quam folia paullo longioribus; floribus circiter 1.5 cm diametro; capsulis aequaliter 3-alatis, 8 ad 10 mm longis, utrinque retusis, alis rotundatis.

An herbaceous plant, the stems creeping, rooting, brown, rather stout, slightly ciliate with long brown hairs; stipules membranaceous, oblong-ovate, acuminate, brown, about 1 cm long, more or less ciliate. Leaves obliquely ovate, membranaceous, 8 to 16 cm long, 5 to 10 cm wide, the upper surface glabrous, the lower distinctly brown-ciliate on the nerves, the base subequally cordate, the lobes broad, rounded, the sinus narrow, acute, 1 to 2 cm deep, the apex distinctly and rather sharply acuminate, the margins slightly and irregularly undulate-lobed, the larger lobes few, none of them exceeding 1.5 cm in length, acute, the smaller ones much broader, rounded or acute; base palmately 7- to 9-nerved; petioles 6 to

20 cm long, distinctly brown-ciliate, the hairs more or less spreading, often curled. Peduncles longer than the leaves, ultimately glabrous, the inflorescence, including the peduncles, 30 to 35 cm long, dichotomously branched, 10 cm wide or less, the bracts broadly orbicular-ovate or reniform-ovate, rounded, brown, about 2.5 mm long, usually somewhat wider, rounded, distinctly punctate-glandular, the bracteoles similar but smaller. Staminate flowers white or pink, about 1.5 cm in diameter. Sepals 2, broadly ovate or suborbicular, rounded, 6 to 7 mm long, more or less punctate with scattered, small, black dots, with about 11 slender nerves. Petals narrowly obovate, 6 to 7 mm long, 3 mm wide, obtuse, narrowed below, 6- or 7-nerved. Stamens more than 50; filaments 1 mm long or less. Capsules equally 3-winged, 8 to 10 mm long, 10 to 12 mm wide, retuse at both ends, the wings reticulate, rounded, 3 to 4 mm wide. Placentae 2-partite.

MINDORO, Baco River, *McGregor 284*, April, 1905; near Lake Naujan, *For. Bur. 6777 6867* (type) *Merritt*, April, 1907. PALAWAN, near Iwahig, *Bur. Sci. 779 Foxworthy*, April, 1906, *Elmer 12857*, March, 1911. LUZON, Province of Tayabas, *Bur. Sci. 13361 Ramos*, *Bur. Sci. 13131 Foxworthy and Ramos*.

A species allied to *Begonia rhombicarpa* A. DC., and related forms, differing especially from DeCandolle's species in its larger size, brown-ciliate petioles and leaves, and especially in its capsules being retuse at both ends and the wings rounded.

43. **Begonia longinoda** sp. nov.

Herba petiolis pedunculis et subtus foliis ad nervos adpresse brunneo-setosis, caulibus prostratis internodiis elongatis; foliis usque ad 10 cm longis, oblique ovato-subreniformibus, basi plus minusve obliquis, cordatis, apice acuminatis, margine leviter irregulariter dentatis vel dentato-lobatis; floribus masculinis sepalis 2 orbicularibus, petalis 2 multo angustioribus; capsulis ellipsoideis utrinque rotundatis, 10 ad 12 mm longis, anguste aequaliter vel subaequaliter 3-alatis.

Stems creeping, rooting at the nodes, somewhat appressed brown-setose, the internodes elongated, 4 to 7 cm long. Peduncles, petioles and lower surfaces of the leaves on the nerves appressed-brown-setose, the petioles and peduncles subequal, 12 to 18 cm long. Leaves 6 to 10 cm long, oblique, ovate-subreniform, base prominently cordate, apex shortly acuminate, margins irregularly dentate or dentate-lobed, the basal nerves 7 to 9, radiating. Inflorescence dichotomously branched, comparatively few-flowered, the lower flowers female, the upper ones male. Male flowers white or pink. Sepals 2, orbicular, 7 to 8 mm long, rounded. Petals 2, narrowly oblong, as long as the sepals. Stamens about 80, the anthers obovoid, about 0.8 mm long. Capsules ellipsoid, 10 to 12 mm long, 8 to 10 mm wide, rounded at both ends or the base subacute, equally or subequally 3-winged, the wings narrow, 2 to 3 mm wide.

LUZON, Province of Tayabas, Tagcauayan, in forests, altitude about 200 m, *Bur. Sci. 13372 Ramos*, March, 1911.

44. Begonia anisoptera sp. nov.

Herba subtus foliis ad nervos petiolisque plus minus dense brunneo-villosis; foliis oblique ovatis, basi cordatis, lobis vix superpositis, apice breviter acuminatis, margine integris vel subintegris; pedunculis foliis subaequilongis; floribus masculinis 2 cm diametro; capsulis valde 3-alatis, alis 2 angustis, rotundatis, planis, 4 ad 5 mm latis, capsulis aequalibus, ala tertia cucullata, 1.5 cm longa, 1.2 cm lata, deorsum extensa.

Stems prostrate, creeping, or the apical parts somewhat erect, more or less villous-ciliate, especially near the tips; stipules oblong-ovate, about 1 cm long, brown, membranaceous, acuminate, more or less ciliate. Leaves obliquely ovate, 6 to 12 cm long, 4 to 8 cm wide, the base cordate, the lobes broad and rounded, the sinus narrow, apex mostly shortly and bluntly acuminate, sometimes slightly prolonged and nearly acute, the margins entire or subentire, not lobed, the upper surface glabrous, the lower ciliate-villous on the nerves, and with scattered, shorter, brown hairs on the surface; base palmately about 7-nerved; petioles 4 to 12 cm long, when young densely covered with long, slender, brown, ciliate hairs, less densely covered when old. Inflorescence as long as or somewhat exceeding the leaves, the peduncles slightly brown-ciliate. Flowers rather few, the staminate ones pink, 2 cm in diameter. Sepals 2, orbicular, 10 mm in diameter, rounded, with about 14 slender nerves, the back with scattered, short, brown, somewhat setose hairs. Petals 2, thinner than the sepals, obovate, about 10 mm long, 8 mm wide, the apex broad, somewhat retuse, the base gradually narrowed, faintly 8-nerved. Stamens about 35; anthers oblong, nearly 2 mm long, somewhat acuminate; filaments 1 to 1.5 mm long. Capsules strongly inequilaterally 3-winged, the capsule proper 1 cm long, the two narrower wings as long as the capsule, 4 to 5 mm wide, rounded, the apex acute, the base retuse, the larger wing 1.5 cm long, 1.2 cm wide, strongly cucullate, rounded, the apex acute, the base extended downward below the capsule and rounded. Placentas 2-partite.

MINDANAO, District of Zamboanga, Zamboanga, *Merrill 5482*, October 10, 1906 (type), on somewhat shadded cliffs in forested ravines, altitude less than 100 m; Port Banga, *For Bur. 12342 Hutchinson*, April, 1908, on boulders in forests altitude about 100 m.

A species quite different from all other Philippine forms of the section known to me, well characterized by its very unequally 3-winged capsules, but especially by the large wing distinctly cucullate, much longer than the capsule, and produced below it. When fresh the leaves are purple beneath and more or less blotched with gray above. Another unusual character, so far as the Philippine species are concerned, which is shared with the next species, is the sepals being more or less ciliate on the back.

45. Begonia suborbiculata sp. nov. § *Diploclinium* (?)

Planta valde succulenta, caulibus petiolis et subtus foliis ad nervos plus minusve dense brunneo-setaceo-ciliatis; foliis suborbicularibus, 5 ad 15 cm diametro, integris, plus minus obliquis, basi cordatis, apice brevissime acuminatis; floribus masculinus sepalis 6 ad 7 mm diametro, extus parce ciliato-setosis; petalis 2, obovatis; staminibus circiter 40; capsulis obliquis, circiter 1.5 cm longis, 5-alatis, alis inaequalibus, una lata, concava, aliis multo angustioribus, planis.

Stems prostrate, creeping and rooting, red when fresh, setose-ciliate with brown hairs. Leaves suborbicular to subreniform, somewhat oblique, 5 to 15 cm long, often a little wider, entire, when fresh very thick and fleshy, firmly chartaceous when dry, base deeply cordate, apex with a short, stout, lateral acumen, the upper surface glabrous except for few long brown hairs on the nerves, the lower surface brown when dry, the nerves densely brown-setose-ciliate; nerves about 9, radiate, often forked; petioles red when fresh, stout, 8 to 15 cm long, densely brown-setose-ciliate; stipules ovate, acuminate, brown-setose, about 1 cm long. Inflorescence as long as the leaves and petioles, erect, glabrous or nearly so, branched at the top, the branches divaricate or spreading, few-flowered, the bracteoles small, deciduous. Male flowers pink. Sepals 2, suborbicular, rounded, 6 to 7 mm in diameter, slightly brown-setose on the nerves outside. Petals 2, oblong-obovate. Stamens about 40; filaments free or nearly so, nearly as long as the anthers, which are oblong, about 1.5 mm long, the connective slightly produced. Female flowers not seen. Capsules oblique, about 1.5 cm long and 2 cm wide with one large concave, oblique wing, and 5 subequal much narrower ones.

PALAWAN, Malampaya Bay, *Merrill 7229*, September 18, 1910, on ledges in forests near the seashore.

A very characteristic species on account of its 5-winged capsules, one wing being concave and very much larger than the other four which are flat. Perhaps not truly referable to the section *Diploclinium*.

46. **Begonia oxysperma** A. DC. in Ann. Sci. Nat. IV 11 (1859) 122, Prodr. 15¹ (1864) 287; F.-Vill. Noviss. App. (1880) 98.

LUZON, without definite locality, probably Mount Banajao, *Lobb 465*, type in herb. Kew.!: Province of Laguna, Mount Banajao, *Bur. Sci. 2441 Foxworthy*, March, 1907, *For. Bur. 886 Klemme*, June, 1904; Mount San Cristobal, *Copeland;* Mount Maquiling, *Merrill 5132:* Province of Benguet, Baguio, *Elmer 6013*, *Williams 986*, March, June, 1904, *Merrill 7688*, May, 1911.

This species was based on *Lobb 465*, but on account of the different localities given on the labels, A. DeCandolle considered the original home of the plant to be uncertain; on the four specimens of this number examined by him, one label (Kew) gave the locality as Luzon, one (St. Petersburg), gave the locality as Java, and two gave no locality. As the species is not uncommon in central Luzon, and as it has not as yet been found outside of the Philippines, it is safe to assume that in this case the locality given on the Kew label is correct. It has been assumed by some botanists that the localities given on Lobb's plants in the Kew set are the correct ones, but this is certainly not always the case. About seven species so far credited to the Philippines solely on the authority of Lobb's specimens, so labelled, almost certainly did not come from the Archipelago, but from Singapore, Borneo, or Java: see Merrill, This Journal 4 (1909) Bot. 149, sub *Loranthus retusus* Jack.

The section *Baryandra* A. DC., is based solely on *Begonia oxysperma*, but I can see no valid reason for making a section for this species distinct from *Diploclinium*. The species is more robust than are the others of the section *Diploclinium*, but in all essential characters appears to me to be quite referable to that section. *Begonia oxysperma* and *B. calcicola* are closely allied, and both have scattered, fimbriate-ciliate paleae, these being the only two Philippine species known to me that possess this character.

47. **Begonia calcicola** sp. nov.

Herba, caulibus crassis, rhizomate stipulis magnis membranaceis brunneis usque ad 2.5 cm longis plus minus ciliatis obtecto; petiolis usque ad 25 cm longis, plus minus fimbriato-paleaceis; foliis oblique ovatis, usque ad 20 cm longis, acuminatis, basi subaequilateraliter cordatis; pedunculis quam petioli longioribus, supra diffuse ramosis; floribus circiter 12 mm diametro; capsulis inaequaliter 3-alatis, apice truncatis, basi rotundatis, circiter 12 mm latis, 8 mm longis.

Herbaceous, the stem creeping, stout, nearly 1 cm in diameter when dry, excluding the stipules, dark-brown, covered with numerous, membranaceous, brown, ovate to oblong-ovate stipules 2 to 2.5 cm long, usually about 1 cm wide, cleft at the apex, the margins more or less fimbriate, the rootlets also very abundant. Leaves membranaceous, brownish when dry, obliquely ovate, 10 to 20 cm long, the base prominently and subequally cordate, the lobes broad, rounded, the sinus 1.5 to 3 cm deep, open, the apex lateral, acuminate, the margins subentire or obscurely undulate-repand, the nerves on both surfaces with scattered, stout, usually more or less curled, brown hairs; petioles at least 20 cm long, with numerous, scattered, brown, slender, more or less fimbriate paleae up to 5 mm in length. Peduncles longer than the petioles, glabrous or slightly brown-ciliate, up to 45 cm long, stout when fresh, dichotomously and rather diffusely branched. Flowers pink or white, the staminate and pistillate ones in the same inflorescence. Pistillate flowers: Pedicels slender, 10 to 13 mm long. Sepals two, suborbicular or orbicular-obovate, 5.5 to 6 mm in diameter. Petals two (sometimes only one), much narrower, narrowly oblong-obovate, about 5.5 mm long, 2.5 mm wide. Style less than 3 mm long, 3-cleft, the branches forked, the stigmas spirally arranged. Staminate flowers slightly larger than the pistillate ones, the sepals and petals similar but slightly larger. Stamens about 35; filaments about 1 mm long, more or less united; anthers oblong-obovoid or obovoid, blunt, less than 1 mm long. Capsule obovoid, about 12 mm in diameter at the apex, 8 mm long, the apex truncate, the base rounded, unequally 3-winged, the wings reticulate, one 6 to 7 mm wide at the apex, the other two about 3 mm in width; placentas 2-lamellate.

LUZON, Province of Rizal, Montalban, *Merrill 7062*, January, 1910 (type), in fruit, *Copeland s. n.*, September, 1908.

This species is found on limestone cliffs in the gorge of the Maraquina River near the water-works dam at Wawa; it is manifestly allied to *Begonia luzonensis* Warb., and *B. manillensis* A. DC., but is at once distinguishable from the above and other forms by its prominently fimbriate paleae.

48. **Begonia fenicis** Merr. in Philip. Journ. Sci. 3 (1908) Bot. 421.

BATANES ISLANDS, Batan, *Bur. Sci. 3619 Félix*, May, 1907 (type), *Bur. Sci. 3207 Mearns*, May, 1907. BABUYANES ISLANDS, *Bur. Sci. 3893 Fénix*, June 17, 1907.

I am disposed to refer here also the following specimen from Lanang, Island of Samar, *Merrill 5237bis*. October 3, 1906, although it differs from the type in some minor respects. Additional material may prove it to be specifically distinct.

Endemic.

49. **Begonia copelandii** sp. nov.

Herba parva, caule repente stipulis brunneis oblongo-ovatis acuminatis usque ad 12 mm longis obtecto; petiolis 4 ad 6 cm longis, parce brunneo-ciliatis; pedunculis quam petioli longioribus, tenuibus, paucifloris; foliis oblique ovatis, basi inaequilateraliter cordatis; floribus masculinis 3 cm diametro; capsulis circiter 1 cm longis, valde inaequaliter 3-alatis, alis 2 obtusis 5 mm latis, tertia 1.5 cm lata.

A small herbaceous plant, the stems creeping or the apices somewhat erect, dark-brown, with numerous, oblong-ovate, acuminate, brown, membranaceous stipules about 12 mm long, 6 mm wide, somewhat ciliate on back especially towards the apex. Leaves obliquely ovate, 5 to 7 cm long, about 5 cm wide, the base inequilaterally cordate, the lobes broad, rounded, the sinus scarcely 1 cm deep, acute, palmately about 7-nerved, the apex acuminate, the margins slightly irregularly sinuate, not lobed, distinctly brown-ciliate, the upper surface glabrous, the lower one with scattered, brown hairs on the nerves, under the lens distinctly white-maculate with small, regular, round dots; petioles 4 to 6 cm long, slightly brown-ciliate or nearly glabrous. Inflorescence slender, glabrous, about 20 cm long, slightly branched. Staminate flowers white or very pale-pink, 3 cm in diameter. Sepals 2, membranaceous, elliptic, rounded, slenderly about 12-nerved, 1.5 cm long, 11 to 12 mm wide. Petals 2, similar in texture to the sepals, oblong-oblanceolate, obtuse, about 14 mm long, 5 mm wide. Stamens about 35; filaments 1 to 1.5 mm long; anthers narrowly obovoid, blunt, about 1 mm long. Capsules about 1 cm long, including the wings 2 cm wide, apex truncate, base broadly rounded, very unequally 3-winged, the larger wing 1.5 cm long, subacute, the two smaller ones about 5 mm wide, obtuse; placentae 2-partite. Peduncles in fruit very slender, 2 cm long.

MINDANAO, District of Davao, Todaya, on rocks along the Baroring River, *Copeland 1255*, April, 1904, altitude about 850 m.

A species manifestly allied to *Begonia colorata* Warb., *B. rhombicarpa* A. DC., and allied forms, well characterized by its unusually large flowers and by its comparatively large, unequally 3-winged capsules.

50. **Begonia parva** sp. nov.

Herba parva omnibus partibus praesertim junioribus plus minus dense ferrugineo-pilosis; foliis inaequilateraliter anguste ovatis vel oblongo-ovatis, usque ad 4 cm longis, integris, acutis vel leviter acuminatis, basi leviter oblique cordatis; pedunculis quam folia longioribus, paucifloris; floribus 2.6 cm diametro; capsulis circiter 1.5 cm longis, inaequaliter 3-alatis.

Small herb, the stems postrate, creeping, with numerous, long, slender, brown, ciliate hairs, and with ovate, brown stipules. Leaves inequilaterally oblong-ovate or narrowly oblong, entire, 2 to 4 cm long, 1.8 to 2.7 cm wide, the apex acute or obscurely acuminate, the base slightly and obliquely cordate, the lobes rounded, the sinus narrow, acute, both surfaces with scattered, long, brown, slender hairs, the margins also ciliate with similar ones, the base palmately 4- or 5-nerved, the nerves faint; petioles 2 to 5 cm long, brown-ciliate, the hairs, as in other parts of the plant, slender, often 4 to 5 mm long. Inflorescence slightly longer than the leaves, the peduncle more or less brown-ciliate, bearing few flowers. Flowers apparently pink, the staminate ones 2.6 cm in diameter. Sepals 2, orbicular, rounded, 13 mm in diameter, with 12 or 13 faint nerves. Petals 2, nearly as long as the sepals, narrowly obovate or obovate, about 7 mm wide, apex broad, rounded, obscurely retuse, the base narrowed. Stamens about 25; filaments 1.5 to 2 mm long; anthers slightly exceeding 1 mm in length. Pistillate flowers about as large as the staminate ones; styles about 4 mm long, 3-cleft, the arms forked; stigmas spiral. Capsule somewhat obovate in outline, including the wings about 1.5 cm long and wide, the widest wing rounded, much longer than the capsule proper, about 6 mm wide, the base acuminate, the apex produced above the capsule, rounded, the other two wings shorter and narrower, about 3 mm wide, all reticulate. Placentae 2- partite.

LUZON, Province of Benguet, Trinidad River, *Bur. Sci. 5551 Ramos*, December, 1908.

A species manifestly allied to *Begonia longovillosa* A. DC., *B. klemmei* Merr., *B. trichocheila* Warb., and related forms, but distinguished from all by its small, oblong- ovate or narrowly oblong, entire leaves.

51. **Begonia klemmei** sp. nov.

Species B. trichocheilæ similis et valde affinis, differt foliis distincte irregulariter plus minus distanter crenato-dentatis, utrinque, praesertim subtus ad nervos, longe rufo-pilosis, valde acute acuminatis, alis capsulam distincte superantibus.

An herbaceous plant, the stem prostrate, creeping, brown, about 6 mm in diameter when dry, the stipules ovate, brown, membranaceous, acuminate, about 1 cm long, more or less brown-pilose in the upper part. Leaves obliquely ovate or oblong-ovate, 5 to 10 cm long, 3 to 6 cm wide, membranaceous, the base prominently and very inequilaterally cordate, the sinus rather narrow, acute, 1 to 1.5 cm deep, both lobes rounded, one much boader than the other, not superposed, apex prominently and sharply acuminate, the acumen usually about 1.5 cm long, margins distinctly distantly and irregularly crenate-dentate, frequently also with few, small lobes which are broader than long, the upper surface, at least when young, with scattered, long, brown hairs, ultimately becoming nearly glabrous, on the lower surface similar hairs more numerous and persistent, the margins prominently ciliate with long brown hairs; base palmately 7- to 9-nerved; petiole 5 to 20 cm long, distinctly villous with long, slender, brown hairs. Peduncles as long as or exceeding the leaves, with few to many long, ciliate, brown hairs, dichotomously branched at the apex, the branched part of the inflorescence about 5 cm long, rather few-flowered. Flowers white, the staminate ones about 2.5 cm in diameter, the slender pedicels 2 cm in length. Sepals 2, broadly elliptic, rounded at both ends, about 12 mm long, 10 mm wide, with about 13 slender nerves. Petals 2, thinner than the sepals, narrowly obovate, 10 to 11 mm long, about 7 mm wide, the apex rounded and prominently retuse, the base gradually narrowed. Stamens about 30; filaments 2 mm long; anthers slightly exceeding 1 mm in length. Pistillate flowers: Sepals and petals not seen: Styles 3-cleft, about 3 mm long, the arms 2- or 3-forked, the stigmas spirally arranged. Capsules about 12 mm long, 13 to 14 mm wide, unequally 3-winged, the wings all rounded, the broad one 6 mm wide, the two narrower ones one-half as wide, all distinctly exceeding the capsule, reticulate, the apex broadly rounded, the base abruptly and obscurely acuminate. Placentas 2-partite.

LUZON, District of Lepanto, Sagada, *For. Bur. 5677 Klemme*, (type), November 8, 1906, on boulders in moist forests, altitude about 1,600 m: Province of Benguet, Baguio, *Williams 1318*, September 24, 1904.

A species manifestly allied to *Begonia trichocheila* Warb., and to *B. longovillosa* A. DC., differing from the former in its prominently and sharply acuminate leaves which are more or less toothed, not entire, and distinctly villous on both surfaces with long, brown hairs, and from the latter in its differently shaped stipules, quite differently shaped leaves, longer petioles, and other characters.

52. **Begonia luzonensis** Warb. in Perk. Frag. Fl. Philip. (1904) 52.

LUZON, Province of Rizal, Montalban, *Warburg 13084*, type in herb. Berol.!: Province of Laguna, Pagsanjan, *Merrill 2187;* Mabalucbaluc Pass, *Bur. Sci. 6045 Robinson*, March, 1908: Province of Bataan, Mount Mariveles, *Merrill 3734*, January, 1904, *Elmer 6849*, November, 1904.

As noted under *Begonia manillensis* A. DC., I am disposed to refer to this species the specimen collected in Luzon by *Lobb*, and referred with doubt by A. DeCandolle to *Begonia manillensis*.

Endemic.

53. **Begonia vanoverberghii** sp. nov.

Planta succulenta, petiolis, pedunculis, et foliis utrinque plus minus longe brunneo-ciliato-setosis; foliis usque ad 20 cm longis, ovatis vel oblongo-ovatis, valde inequilateralibus, basi oblique cordatis, apice longe acuminatis, margine irregulariter acute dentato-lobatis; floribus masculinis roseis, sepalis 2, orbicularibus, 12 ad 15 mm longis, petalis 2, obovatis; staminibus circiter 40; capsulis late obovatis, apice truncatis, inaequaliter 3-alatis, 2 cm longis, 3 ad 3.5 cm latis.

A species most closely allied to *Begonia luzonensis* Warb., differing especially in its much larger capsules. Peduncles, petioles, both surfaces and margins of the leaves with few to many slender, brown, ciliate hairs 3 to 5 mm in length. Leaves ovate to oblong-ovate, chartaceous when dry, strongly obliquely inequilateral, 15 to 20 cm long, 6.5 to 13 cm wide, base strongly cordate, apex slenderly acuminate, margins irregularly and rather coarsely acutely toothed-lobed, the sinuses often shallow, rounded, or the margin on the narrow side of the leaf entire or subentire; nerves 9, radiate; petioles 16 to 20 cm long. Inflorescence as long as the leaves, when young with many brown hairs, at maturity glabrous or nearly so, the peduncle up to 30 cm long, dichotomously branched at the apex. Male flowers pink. Sepals 2, orbicular, rounded, 12 to 15 mm in diameter. Petals 2, obovate, 10 to 13 mm long, 8 mm wide, apex retuse. Stamens about 40; filaments slender, free, about 2.5 mm long; anthers obovate, 1 mm long. Female flowers not seen. Capsules very broadly obovate, unequally 3-winged, about 2 cm long, 3 to 3.5 cm wide, the apex truncate, the base rounded or subacute, the larger wing 1.5 cm wide, the two narrower ones less than 1 cm wide.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 831*, September and November, 1910, along small streams, the first collection with male flowers, the second with male flowers and mature fruits. Locally known to the Bontoc Igorots as *ganabeng*.

54. **Begonia trichocheila** Warb. in Perk. Frag. Fl. Philip. (1904) 53.

LUZON, Province of Rizal, Montalban, *Warburg 13260*, type in herb. Berol.!, *Loher s. n.*, *Merrill 7063*, January, 1910. Possibly referable here is *Bur. Sci. 12958 Fénix*, from Bauang, Union Province, Luzon, but the leaves are very much larger than in the type, and no fruits were collected.

Through inadvertence the sepals and petals, in the original diagnosis, are described as 5 cm(!) long, and the pedicels 1.5 to 2 m(!) long, apparent errors in both cases, the first for mm and the second for cm. The description of the flowers may have been drawn up from immature plants, for on both the other specimens cited above, which undoubtedly represent the species, have the sepals of the staminate flowers from 1 to 1.2 cm in length.

Endemic.

55. **Begonia manillensis** A. DC. in Ann. Sci. Nat. IV 11 (1859) 129, Prodr. 15¹ (1864) 323; F.-Vill. Noviss. App. (1880) 98; Ceron Cat. Pl. Herb. (Manila) (1892) 88.

LUZON, Province of Rizal, Bosoboso, *For. Bur. 2690 Ahern's collector*, January, 1905; San Isidro, *Bur. Sci. 73 Foxworthy*, January, 1906: Province of Bulacan, *Yoder*, December, 1906: Province of Benguet, Mount Pulog, *For. Bur. 16175 Curran, Zschokke, & Merritt*, January, 1909.

The type of this species was collected in the Philippines by Perrottet, and is preserved in the Herbarium of the Museum of Natural History, Paris; this specimen I have not seen, but the material cited above agrees well with the description. I have examined the specimen collected by *Lobb* (herb. Kew.), cited by A. DeCandolle as doubtfully referable to *B. manillensis*, but consider Lobb's specimen rather referable to *Begonia luzonensis* Warb.

Endemic.

56. **Begonia alvarezii** sp. nov.

Herba succulenta partibus basilaribus brunneo-ciliatis exceptis glabra; foliis 11 ad 18 cm longis, in siccitate membranaceis, oblique oblongo-ovatis, integris, basi lateraliter valde cordatis, apice rotundatis; pedunculis elongatis, quam folia longioribus; floribus ignotis; capsulis obovatis, circiter 15 mm longis, 15 ad 18 mm latis, basi acutis, apice late rotundatis vel truncatis, inaequaliter 3-alatis.

A succulent herb the rootstocks and bases of the petioles and peduncles more or less densely clothed with long brown ciliate hairs, otherwise glabrous or nearly so. Leaves oblong-ovate, membranaceous when dry, entire, 11 to 18 cm long, 6 to 11 cm wide, the apex rounded, the base laterally deeply cordate, the sinus narrow, both lobes broadly rounded; nerves about 10, radiate; petioles 11 to 20 cm long. Peduncles up to 40 cm in length, dichotomously branched above, the capsule bearing parts 10 to 12 cm long. Flowers unknown. Capsules broadly obovate, about 15 mm long, 15 to 18 mm wide, unequally 3-winged, the base subacute, the apex broadly rounded or truncate, the larger wing 6 to 7 mm wide, the other two about 5 mm wide.

LUZON, Province of Nueva Ecija, Santor River, *For. Bur. 22446 Alvarez*, February, 1911.

Well characterized by its entire leaves, the whole plant being glabrous except for the long brown ciliate hairs at the base.

57. **Begonia gracilipes** sp. nov.

Suffruticosa, scandens, ramulis petiolisque parcissime setosis exceptis glabra; caulibus radicantibus, brunneis; foliis leviter oblique ovatis, acuminatis, basi subaequilateraliter rotundatis, margine distanter irregulariter dentatis denticulatisque, vix lobatis, membranaceis, usque ad 8 cm longis, petiolo 5 ad 7 cm longo; inflorescentiis axillaribus, brevibus, paucifloris; floribus masculinis longe pedicellatis, circiter 2 cm diametro; capsulis turbinatis, circiter 1.8 cm diametro, aequaliter 3-alatis.

A scandent suffrutescent plant, growing on tree-trunks, the stems rooting at the nodes, branching, brown, and with the petioles with very few, short, scattered, setose hairs, otherwise the plant quite glabrous. Leaves ovate, slightly inequilateral, membranaceous, glabrous, shining and greenish when dry, 4 to 8 cm long, 2.5 to 5 cm wide, the base rounded, subequilateral, not cordate, the apex distinctly acuminate, the margins distantly and irregularly dentate and also denticulate, not lobed; basal nerves usually 5; petioles slender, 5 to 7 cm long; stipules brown, membranaceous, lanceolate, slenderly acuminate, nearly 1 cm long. Staminate inflorescence axillary, few-flowered, the peduncle and rachis

1 cm long or less, slender, the bracts lanceolate, acuminate, about 2 mm long. Sepals two, ovate or oblong-ovate, about 1 cm long and 6 mm wide, obtuse. Petals none. Stamens about 25; anthers broadly ovoid, retuse, less than 1 mm long; filaments about 1 mm long, more or less united, forming a somewhat elongated torus. Capsules solitary, axillary, pedicellate, 1.3 to 1.5 cm long, about 1.8 cm wide, equally 3-winged, the upper outer corners of the wings rounded; placentae 2-partite.

LUZON, Province of Cagayan, Claveria, *Bur. Sci. 7393 Ramos*, March 13, 1909, on trees in forests, flowers white.

A species manifestly allied to *Begonia aequata* A. Gray, and *B. lagunensis* Elm., differing from both in its relatively broader leaves, but especially in its elongated petioles which are about as long as the leaf-blades.

58. **Begonia lagunensis** Elm. Leafl. Philip. Bot. 2 (1910) 735.

Species B. aequatae A. Gray simillima et valde affinis, differt foliis majoribus, usque ad 9 cm longis, capsulis majoribus, usque ad 1.6 cm longis, petiolo 1.5 ad 3 cm longo.

LUZON, Province of Tayabas, Lucban, *Elmer 9327* (type number); Infanta, *Bur. Sci. 9440 Robinson:* Province of Laguna, Mount Maquiling, *Merrill 6302, 7136:* Province of Rizal, *Loher 6093.* NEGROS, Canlaon Volcano, *Merrill 6981*, April, 1910, in forests, altitude about 1700 m; Mount Silay, *For. Bur. 4224 Everett*, February, 1906, altitude about 1,000 m. MINDORO, Mount Halcon, *Merrill 6135*, November, 1906.

Manifestly closely allied to *Begonia aequata* A. Gray, but distinct, readily separated by the characters indicated in the diagnosis above.

59. **Begonia aequata** A. Gray Bot. Wilkes U. S. Explor. Exped. (1854) 658; A. DC. Prodr. 15[1] (1864) 321; F.-Vill. Noviss. App. (1880) 99; Merr. in Philip. Journ. Sci. 3 (1908) Bot. 84, *pl. 4.*

LUZON, Province of Laguna, Los Baños and Mount Maquiling, *Wilkes Expedition*, type in U. S. National Herbarium, *Elmer 8324*, April, 1906. The specimen collected by *Lobb*, preserved in the Kew Herbarium, and doubtfully referred here by A. De Candolle is either this species or the preceding one.

DOUBTFUL AND EXCLUDED SPECIES.

BEGONIA REPENS Blume: A. Gray Bot. Wilkes U. S. Explor. Exped. (1854) 658; Merr. in Philip. Journ. Sci. 3 (1908) Bot. 84.

The specimen on which the above Philippine record was based does not seem to be extant. *Begonia repens* Blume is a synonym of *B. mollis* A. DC., of Java, Sumatra, and Borneo; I have seen no Philippine material that I consider referable to the species.

BEGONIA CRASSICAULIS A. DC.; Usteri Beitr. Ken. Philip. Veg. (1905) 118.

Probably a pure error in identification, so far as Usteri's record is concerned, or the specimens were taken from an introduced and cultivated plant. The species is definitely reported only from Guatemala.

BEGONIA BORNEENSIS A. DC.; F.-Vill. Noviss. App. (1880) 98.

BEGONIA ISOPTERA Dryand.; F.-Vill. l. c.

The above two species were credited to the Philippines by F.-Villar, but I have seen no material from the Archipelago that I consider referable to either; probably admitted on erroneous identifications.

ERRATA.

Page 58, line 7 from the top for de read die, and for eigentumliche read eigentümliche.

Line 27 from the bottom, for extreme read extremen.

Page 61, line 17 from the bottom, for terminales read terminalis.

Page 62, line 13 from the top, for terminales read terminalis.

Line 16 from the bottom, for Léviellé read Leveillé.

Page 225, line 4 from the bottom, for *junghunnii* read *junghuknii*.

Plate I, legend, for VARIABLE read VARIABILE.

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(New genera and species and combinations published for the first time are in **black-faced type**; synonyms and species incidentally mentioned in the text are in *italics*.)

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